

Environmental Assessment

DOI-BLM-NV-W010-2010-0004-EA

New York Canyon

Geothermal Exploration Project

Humboldt River Field Office/Nevada

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It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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B	ROW Grant General Terms and Conditions

ACRONYMS AND ABBREVIATIONS

°F	degree(s) Fahrenheit
ACEC	Area of Critical Environmental Concern
Act	Geothermal Steam Act of 1970
AFY	acre-feet per year
APE	Area of Potential Effect
AUM	animal unit month
BAPC	Bureau of Air Pollution Control
BLM	U.S. Bureau of Land Management
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIAA	Cumulative Impacts Assessment Area
DoD	U.S. Department of Defense
DOE/FOE	Determinations of Eligibility and Finding of Effect
EA	Environmental Assessment
EIS	Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
GDP	Geothermal Drilling Permit
GHG	greenhouse gas
GPS	global positioning system
H ₂ S	hydrogen sulfide
MFP	Management Framework Plan
mg/L	milligram(s) per liter
NAAQS	National Ambient Air Quality Standards
NDEP	Nevada Division of Environmental Protection
NDOM	Nevada Division of Minerals
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NILS	National Integration Land System
NNHP	Nevada Natural Heritage Program
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

NWI	National Wetlands Inventory
OHV	off-highway vehicle
OSHA	Occupational Safety and Health Administration
PEIS	Programmatic Environmental Impact Statement
PFYC	Potential Fossil Yield Classification
PHPA	polyacrylamide / polyacrylate
PM ₁₀	particulate matter smaller than 10 microns in aerodynamic diameter
PM _{2.5}	particulate matter smaller than 2.5 microns in aerodynamic diameter
PMU	population management unit
ppm	part(s) per million
PVC	polyvinyl chloride
ROW	right-of-way
SHPO	State Historic Preservation Office
SPCC	spill prevention, control, and countermeasures
SWPPP	Stormwater Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project
TCP	Traditional Cultural Property
TDS	total dissolved solids
TGP	TGP Dixie Development Company
THPO	Tribal Historic Preservation Officer
USBR	U.S. Bureau of Reclamation
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	visual resource management

1.0 INTRODUCTION

1.1 Background

In late 2008, TGP Dixie Development Company, LLC (TGP), through its wholly owned subsidiary Nevada Power Vestors, purchased five federal geothermal leases in the New York Canyon area from Caithness Energy. In July 2009, TGP purchased two additional geothermal leases in the area from the Bureau of Land Management (BLM) for a total of seven federal geothermal leases. The geothermal leases held by TGP for the New York Canyon Lease Area (Lease Area) comprise 15,934 acres. The Lease Area is approximately 25 miles east-southeast of Lovelock, Nevada, in Pershing and Churchill Counties, Nevada (see Figure 1). TGP has gained extensive understanding of the geothermal resource from the operation of its nearby existing Dixie Valley geothermal power plant and from previous exploration and development work performed in the New York Canyon and adjacent Dixie Valley areas by Caithness Energy, Oxbow Geothermal Corporation, Sun Geothermal Company, and Trans Pacific Geothermal.

The BLM Humboldt River Field Office (HRFO) received and accepted a geothermal operations plan from TGP on November 23, 2009, under the provision of 43 CFR 3261.12. The operations plan describes construction of up to 15 well pads for the purpose of drilling geothermal observation wells, construction of on-lease access roads, surface pipelines and associated ancillary facilities (including a man-camp) at TGP's New York Canyon geothermal Lease Area.

To allow for flexibility, TGP has identified a reduced area where the proposed 15 wells may be drilled. While the Lease Area actually consists of seven geothermal leases owned by TGP, operations are being proposed on up to six of the leases within the Lease Area. The primary area of interest within the six lease areas has been identified as the Project Area.

On February 2, 2010, TGP submitted to BLM, an application for a right-of-way (ROW), for off-lease access roads to the Lease Area and access roads and above ground piping between the six lease parcels that constitute the proposed project site. The proposed ROW has been assigned serial number NVN-88195.

Under the provisions of 43 CFR 3261.11 and 13, a complete drilling program and individual Geothermal Drilling Permits (GDPs) would be submitted for approval prior to drilling and well pad construction separately from this document.

1.2 Purpose and Need

The BLM's purpose is to provide legal access to TGP's geothermal leases and allow the construction of on-lease access roads and well pads for exploration drilling activities in a manner that ensures the exploration proceeds as allowed by the terms of the lease and any special stipulations that have been made part of the lease.

The need for the action is established by the BLM's responsibility under the Geothermal Steam Act of 1970 and the implementing regulations under 43 CFR 3260 and the Minerals Leasing Act of 1920 as amended under the implementing regulation of 43 CFR 2800.

Decisions to be Made

The BLM will decide whether or not to grant the ROW and if so under what terms and conditions, whether to approve the operations plan and if so under what conditions of approval, and any surface conditions of approval for the GDPs when they are issued.

1.3 Land Use Plan Conformance

The Project Area is subject to the BLM, Winnemucca District Office Sonoma-Gerlach Management Framework Plan III (MFP), dated July 9, 1982. Objective M-5 of the Sonoma-Gerlach MFP states: “Make energy resources available on all public lands and other lands containing federally owned minerals.” The MFP provides for the development of geothermal resources in noncompetitive areas and all Known Geothermal Resource Areas (KGRAs), except those that are areas of significant environmental conflict or have historical and/or cultural significance as defined in District Manager’s Decision. The Proposed Action is in conformance with the MFP.

1.4 Relationship to Laws, Regulations, Policies, Other Plans, and Other Environmental Analyses

The EA has been prepared in accordance with the following statutes and implementing regulations, Policies and Procedures:

- The National Environmental Policy Act (NEPA) of 1969, as amended (Public Law [PL] 91-190, 42 U.S.C. 4321 *(et seq.)*)
 - 40 CFR 1500 *(et seq.)*. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act
 - Considering Cumulative Effects under NEPA [CEQ 1997]
 - 43 CFR Part 46, Implementation of the National Environmental Policy Act (NEPA) of 1969; Final Rule, effective November 14, 2008
 - U.S. Department of the Interior (USDI) requirements (Departmental Manual 516, Environmental Quality [USDI, 2004])
 - BLM NEPA Handbook (H-1790 1), as updated (BLM, 2008a)
- The Geothermal Steam Act of 1970 (30 USC 1001-1025)
 - 43 CFR 3200, Geothermal Resources Leasing and Operations; Final Rule, May 2, 2007
- 43 CFR 2800, *Rights-of-Way, Principles, and Procedures: Rights of Way under the Federal Land Policy and Management Act and the Mineral Leasing Act*; Final Rule, April 22, 2005.
- The 2005 Energy Policy Act; The National Energy Policy, Executive Order 13212
- Best Management Practices (BMPs) as defined in *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, Fourth Edition* (Gold Book) (BLM, 2007)

In 2002, the BLM Winnemucca District Office completed the “Geothermal Resources Leasing Programmatic Environmental Assessment.” Special stipulations developed in the Programmatic EA were applied to geothermal leases subsequently issued by the BLM, including five (N-74854, 76298, N-76299, N-76300, and N-76301) of the seven federal leases that are the subject of this EA.

In 2008, the BLM completed the Programmatic EIS for Geothermal Resources Leasing in the Western United States (BLM, 2008b). Special stipulations developed in this Programmatic EIS were applied to geothermal resource leases subsequently issued by BLM, including the federal geothermal leases (N-86890 and N-86893) issued to TGP in 2009. The five other leases included in the Proposed Action area (N-74854, 76298, N-76299, N-76300, and N-76301) predate issuance of the Programmatic EIS (BLM, 2008b). Copies of the stipulations for all seven leases are attached to this EA as Appendix A. TGP is required to comply with these lease stipulations.

The Proposed Action would be subject to other applicable state and local permits prior to beginning construction.

1.5 Issues

By internal and external scoping, the following issues were identified with regard to the Proposed Action:

- What potential effects on air quality could occur as a result of implementation of the Proposed Action?
- How could existing cultural resources, including archaeological sites and Traditional Cultural Properties, be affected by implementation of the Proposed Action?
- How could the Proposed Action affect the potential spread of invasive, non-native species?
- How could migratory birds be affected by implementation of the Proposed Action?
- What potential effects could occur on traditional Native American religious concerns and lifestyles, including potential effects on surface water resources?
- What is the potential for hazardous or solid wastes to affect the environment as a result of the Proposed Action?
- What potential impacts to surface or ground water quality and quantity could occur as a result of the Proposed Action?
- How could the Proposed Action affect wetlands and riparian zones?
- How could soils and vegetation be affected by the Proposed Action?
- What potential impacts could occur to wildlife resources and special-status species?
- How could recreational activities be affected by the Proposed Action?
- What potential effects could occur to the local economy and to lands and realty from implementation of the Proposed Action?
- How would wild horses and burros be affected by implementation of the Proposed Action?

- Other potential resources that could be affected through implementation of the Proposed Action consist of paleontological resources and fire resources.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

TGP proposes to evaluate the characteristics of the geothermal resources within the New York Canyon Lease Area by drilling up to 15 geothermal observation wells to depths of up to 10,000 feet, conducting observation well testing activities, improvements to existing roads, construction of roads and drilling pads, and ancillary facilities. To allow for flexibility, TGP has identified a portion of the Lease Area called the Project Area where the proposed 15 wells may be drilled.

The Lease Area consists of approximately 15,934 acres located in Pershing and Churchill counties, Nevada (see Figure 1). TGP proposes to conduct geothermal exploration within the Project Area. The Project Area comprises 2,315 acres in the New York Canyon Lease Area. Figure 2 shows the Project Area. Under the Proposed Action, up to a maximum of 15 geothermal observation wells would be drilled within the boundaries of the Project Area. Access roads would also be constructed and/or improved. The specific locations for well pads and access roads would be identified in individual Geothermal Drilling Permits (GDPs) which would be submitted for approval prior to drilling and well pad construction separately from this document. Drilling operations would be conducted in accordance with BLM and Nevada Division of Minerals (NDOM) regulations and permit requirements.

Each successfully completed well pad throughout the Project Area would undergo interim reclamation. Drilling pads located in the southern polygon of the Project Area (leases N-76299, N-76300, and N-86890) would undergo interim reclamation within six months of completion of well drilling and flow testing. Wells located in the central or northern polygons of the Project Area would undergo interim reclamation within three years of completion of well drilling and flow testing. All interim reclamation measures would be done in accordance with BLM and Nevada Division of Minerals (NDOM) requirements, including recommendations provided in the BLM Gold Book (2007). All exploratory drilling would be completed within three years.

2.1.1 ROW for Off-Lease Access

Access to the site would be by existing county or state roads. Existing access roads are present on BLM-managed land, but most portions of these existing roads are located outside the TGP lease areas. Typical access to the New York Canyon project site would be from Lovelock, Nevada, along route 857 (East Coal Canyon Road, which becomes Fencemaker Flat Road near the project site) up to an existing access road, as shown in Figure 3.

TGP would be required to obtain ROW authorization from BLM for off-lease access. The Proposed Action is considered to be lease based and a ROW would be required for access from lease boundary to lease boundary. On February 2, 2010, TGP submitted a ROW application (SF299) for off-lease access and the surface pipelines. The ROW is further described as follows.

ROW to Lease N-74854

The ROW for the main access road would begin at the last point of legal access off Fencemaker Flat Road (Pershing County does not have a road number for this road). More specifically, beginning at T. 26N., R. 35E., sec. 26, W½, an existing road would be improved on BLM land

that would proceed South approximately 1 mile, to the lease boundary for lease number N-74854 at T. 26N., R. 35E., sec. 35.

ROW to Lease N-76298

The ROW would proceed south through T. 26N., R. 35E., sec. 35, in lease number N-74854 approximately 1 mile to the lease boundary for lease number N-76298 at T. 25N., R. 35E., sec. 2, W $\frac{1}{2}$.

ROW to Lease N-76299

The ROW would proceed south in lease number N-76298 approximately $\frac{3}{4}$ mile through T. 25N., R. 35E., sec. 2, N $\frac{1}{2}$ to where the road triangulates at a point, then southwesterly along T. 25N., R. 35E., sec. 2, S2 approximately $\frac{1}{2}$ mile to the lease boundary for lease number N-76299 at T. 25N., R. 35E., sec 11.

ROW to Lease N-76300

The ROW would proceed southwesterly in lease number N-76299 approximately $\frac{1}{2}$ mile through T. 25N., R. 35E., sec. 11 NW $\frac{1}{4}$ proceeding southwesterly approximately $\frac{3}{4}$ mile through T. 25N., R. 35E., sec 10, E2 to the lease boundary for lease number N-76300 at T. 25N., R. 35E., sec. 15.

ROW to Lease N-86890

The ROW would proceed southwesterly in lease number N-76300 approximately $\frac{3}{4}$ mile through T. 25N., R. 35E., sec. 15, W $\frac{1}{2}$ to the lease boundary for lease number N-86890 at T. 25N., R. 35E., sec. 16.

ROW to Lease N-76301

The ROW would also proceed northeasterly at a point beginning at T. 25N., R. 35E., sec. 2, E $\frac{1}{2}$ in lease number N-76298 and through T. 25N., R. 35E., sec. 1, N2 for approximately 1 $\frac{1}{4}$ miles to the lease boundary for lease number N-76301 at T. 26N., R. 35E., sec. 36.

ROW to Lease N-86893

The ROW would proceed northeasterly in lease number N-76301 approximately 2 $\frac{1}{4}$ miles through T. 26N., R. 35E., sec. 36, SE $\frac{1}{4}$ and through T. 26N., R. 36E., sec. 31, S2 and terminating at T. 26N., R. 36E., sec. 32, N2 at the lease boundary for lease number N-86893.

The ROW would also encompass several smaller segments for crossing leaseholds as shown on Figure 3.

The total length of the ROW would be up to 44,575 feet (8.44 miles) for up to 27.15 acres of disturbance assuming a 25-foot wide area of disturbance and turnouts located approximately every 1,000 feet, measuring 12 feet wide by 100 feet long.

2.1.2 On Lease Access

In addition to the ROW for off-lease access and crossing leaseholds, up to 3.5 miles total of new road would be constructed within the Project Area for an additional 10.6 acres of disturbance assuming a 25-foot wide area of disturbance and turnouts located approximately every 1,000

feet, measuring 12 feet wide by 100 feet long. This construction would facilitate the access to each well pad and the laying of surface pipelines.

A temporary surface water pipeline is being proposed as an optional way to transport water during exploration activities. This pipeline would be constructed along the proposed access roads. Portions of this temporary surface pipeline would be both on Lease and off Lease. The right of way application included the temporary surface water pipeline.

2.1.3 Operations Plan

The Proposed Action includes installation and testing of up to 15 observation wells in the New York Canyon Lease Area. Development of each of the observation wells within the lease areas would disturb up to 2.8 acres of land. New road construction would be needed to access each of the leaseholds and to access each of the locations where observation wells would be constructed. Table 1 presents the acreage of area disturbance associated with the observation wells and the maximum assumed area of disturbance associated with possible access roads.

TABLE 1
Summary of Observation Well Pad and Access Road Disturbed Areas

Disturbance Type	Length of Access Roads (feet)	Number of Well Pad Locations	Aggregate Applied?	Dimensions of Disturbed Area	Number of Turnouts (Disturbed Area)	Total Disturbed Area (acres)
Observation test well pads ^a	NA	15	Yes	350 × 350 feet (2.8 acres each)	NA	42
Access roads ^b	63,017 feet	NA	Yes	63,017 × 25 feet	44 (63,888 ft ²)	37.8
Groundwater well ^c	NA	1	Yes	150 feet x 150 feet		0.5
Access road to groundwater well ^b	2,640 feet	NA	Yes	2,640 x 25 feet	1 (1,450 ft ²)	1.5
Total Disturbed Area for Proposed Well Pads and Access Roads						81.8

^aThe well pad dimensions include space for storage of drilling equipment, drilling vehicles, and storage of topsoil and spoil material. Laydown areas that would be required for drilling operations would be located on each of the well pads as indicated on Figure 4.

^bTotal disturbed acreage for the roads includes: (1) the approximate length of the new gravel roads from the closest existing road to the well pad served by the road and (2) a total of 44 turnouts (12 feet by 100 feet with 21-foot transitions at either end of the turnouts) located approximately every 1,000 feet along the access road and 1 turnout along the access road to the groundwater well. The exact locations for the well pads, roads, and turnouts would be verified using global positioning system (GPS) and submitted to BLM prior to construction.

^cGroundwater well may be installed on an identified well pad or it may be installed in a separate area. A sundry notice would be submitted to the BLM if the groundwater well is installed outside of an identified well pad area. NA = not applicable

Figure 4 shows a typical well pad layout. Each well pad would be 350 feet by 350 feet and would accommodate the drilling rig, reserve pit, and support equipment and vehicles used during drilling. Exact dimensions and orientations of the well pads would be determined by engineers in

the field prior to construction to best match the physical and environmental characteristics of the specific site and minimize grading. The proposed well pad locations within the Project Area would be located on relatively flat topography (2 to 8 percent slopes) that gently slopes north and northwest (see Figure 2). Because of the existing topography, there would be no need to construct well pads on steep slopes or narrow ridges. Fill slopes constructed as part of well-pad grading using spoils from reserve pit excavation would be constructed with a maximum slope of 2:1. Slopes would be compacted and maintained to minimize erosion and provide slope stability. The well pads would be constructed to avoid ephemeral washes, to the extent practicable.

After the well pad area has been graded and spoils from the well pad reserve pit excavation have been laid down for leveling, an average of 8 inches of gravel would be placed over the areas where the drilling work would be conducted, an area of approximately 110 feet by 350 feet. The well footprint (40 feet by 40 feet) would require additional stabilizing for heavier equipment and would receive an additional 10 inches (for a total average of 18 inches) of compacted aggregate (see Figure 4).

A reserve pit would be excavated on each well pad for the temporary storage of drilling muds and fluids, flow test fluids, and drill cuttings consistent with the applicable BMPs identified in the Gold Book (BLM, 2007). Each reserve pit would have up to 1 million gallons of capacity, and the interior would be approximately 320 feet long, 125 feet wide, and a maximum of approximately 6 feet deep below grade with at least 2 feet of freeboard. The actual excavation depth of each reserve pit would be determined based on the depth to groundwater to ensure that the bottom of the reserve pit is above the standing water level. Settled bentonite clay from drilling mud would accumulate on the bottom of the reserve pits to act as an unconsolidated clay liner to minimize percolation. Excess material from reserve pit excavation would be stockpiled in the laydown area of the well pad. Stormwater runoff from undisturbed areas around the constructed drill pads would be directed into ditches surrounding the well pad and back onto undisturbed ground consistent with BMPs for stormwater. Each well pad would be graded to prevent the movement of stormwater off of the constructed site. Excavation into native soil during construction of drill pad reserve pits would be minimized to the maximum extent possible.

Depending on well production rates identified during flow testing, additional sump capacity could be required to accommodate up to three days testing at a flow rate of up to 1,500 gallons per minute and to avoid any discharge of flow test fluids on adjacent public land. To provide this capacity, a large central sump with a measurement of 250 feet by 250 feet would be constructed in the center of the Project Area on one of the 15 proposed and inactive well pad locations. This additional sump would measure approximately 13.7 feet deep, including 2 feet of freeboard. Excavation into native soil during construction of the central sump would be minimized to the maximum extent possible. The central sump would add approximately 5.5 million gallons to the 1-million-gallon capacity provided in the reserve pit on each active pad. Construction of the central sump would disturb a total area of up to 350 feet by 350 feet, or approximately 2.8 acres. Excess fluids from each well would be trucked to the central sump or piped using high temperature polyvinyl piping. If used, piping would be placed along roads and would not result in additional disturbance.

Fencing, netting, or other measures would be provided at each well pad and central sump location sufficient to prevent access to the pits by wildlife, domestic livestock, and the public

consistent with the Gold Book pages 17-18 (BLM, 2007). A wellhead or appropriate cover would be in place at all times after drilling to prevent the well from producing. A screen or fence will be placed around or over the annulus (well cellar) to prevent wildlife from falling in and not being able to get out.

Upon completion of the drilling operations, clean-out and flow tests would be performed on the wells. Flow testing would typically occur for an average of 3 days (24 hours a day) for each well, although the duration could vary depending on well characteristics. During these tests the flow would be routed to the reserve pit, with overflow to the central sump. It is anticipated that the initial flow rates of fluid from each well into its reserve pit and central sump would be approximately 500 to 1,500 gallons per minute, on average, depending on the productivity of the well.

2.1.3.1 Drilling Plan

Drilling each of the 15 proposed wells would take approximately 8 weeks, although this construction period could be extended based on site-specific conditions. Drilling would be conducted 24 hours per day, 7 days per week by a crew of up to 12 workers per well. Site preparation, including drill rig assembly, would require approximately 1 to 2 weeks per well and would require fewer people on site during this time (up to six).

Each well would be drilled using a large diesel rotary drilling rig with a power rating ranging from 1,000 to 3,000 horsepower. During drilling, the top of the drill rig derrick would be up to 160 feet above the ground surface, depending on the rig used. The typical drill rig and associated support equipment (for example, rig floor and stands; draw works; mast; drill pipe, trailers; mud, fuel, and water tanks; diesel generators; air compressors) would be transported to the prepared pad on 7 to 10 large tractor-trailer trucks. Up to approximately eight vehicles (small trucks, service vehicles, workers' vehicles) could be driven to the active well site each day throughout the typical 8-week drilling process. Typically, one drill rig would be on site at a time but TGP could elect to drill up to three wells at once, bringing the total crew to as many as 36. Crews would include the drilling supervisor, geologists, suppliers, and operators. Observation wells would be grouted and cased to prevent water quality effects on groundwater during or after well installation. A GDP application would be submitted for approval for each well as the project progresses. Detailed well construction information would be provided in the GDP application, to be reviewed and approved separately by BLM. The GDP application would include detailed information on borehole geophysics analyses (cement bond logs) as well as engineering to ensure that any geothermal fluid encountered during drilling does not flow uncontrolled to the surface. Specific engineering designs would include the use of "blow-out" prevention equipment during drilling and the installation of well casing cemented into the ground. The analysis in this EA takes into account the use of these engineering designs and drilling practices.

Consistent with the Occupational Safety and Health Administration Safety and Health Regulations (Title 29, CFR, Section 1910.1 to 1910.1500), a hydrogen sulfide monitoring system would be on the drill rigs, the mud tanks, and shaker system to protect workers.

Table 2 shows approximate quantities of common materials and chemicals used during well drilling.

Water required for drilling operations is described in Section 2.1.5.

TABLE 2

Approximate Quantities of Common Materials and Chemicals Used During Well Drilling

Product	Quantity Used	Quantity Stored
Drilling Mud Gel (Bentonite Clay)	334,000 lbs	100 lb sacks on pallets
Salt (NaCl)	134,000 lbs	50 lb sacks on pallets
Barite (BaSO ₄)	20,000 lbs	50 lb sacks on pallets
Tannathin (Lignite)	4,200 lbs	50 lb sacks on pallets
Lime (Calcium Hydroxide)	3,400 lbs	50 lb sacks on pallets
Caustic Soda (Sodium Hydroxide)	1,700 lbs	50 lb sacks on pallets
Diesel Fuel	54,000 gals	6,000 gal tank
Lubricants (Motor Oil, Compressor Oil)	1,700 gals	55 gal drums
Hydraulic fluid	400 gals	55 gal drums
Anti-Freeze (Ethylene Glycol)	220 gals	55 gal drums
Liquid Polymer Emulsion (partially hydrolyzed polyacrylamide / polyacrylate (PHPA) copolymer)	170 gals	5 gal buckets

2.1.3.2 Structures and Equipment

Under the Proposed Action, the following structures would be constructed and equipment used during drilling. Additional detail regarding these structures is provided below.

- One reserve pit with a 1-million-gallon capacity at each well pad (described in Section 2.2.1)
- One central sump with a 5.5-million-gallon capacity located in the center of the Project Area at one of the inactive well pad locations
- Temporary worker camp (consisting of self-contained trailers, located at one inactive well pad)
- Chemical toilets at each active well pad
- Temporary water storage tanks (at each active well pad)
- Temporary sanitary storage tanks
- Pipe racks (stored at each well pad)
- Fuel storage area with secondary containment (located at one well pad)
- Equipment
 - One diesel generator for standby and start-up
 - Air compressors
 - Personnel vehicles (pickup trucks)
 - Geothermal rotary drilling rigs
 - Construction equipment, including dump trucks, road graders, and bulldozers

2.1.4 Actions Proposed on Private Lands

No actions are proposed for private lands.

2.1.5 Road Construction Activities

Gravel roads, where not already in existence, would be constructed to each of the well sites and would remain within the proposed Project Area. Under the Proposed Action, up to 65,657 feet of new roadway has been estimated, resulting in approximately 39.3 acres of disturbance.

The newly constructed access roads would have the following characteristics:

- Roads would be 25 feet wide, including travel way, shoulders, and drainage ditches. Roadways would have a travel way of 15 feet with 2-foot shoulders and 3-foot drainage ditches on either side. Road designs, including road cross-section and crowns, rolling dip designs and placement, and road plans and profiles would be executed in accordance with Gold Book standards (pages 19-21; BLM, 2007).
- Aggregate would be applied to the approximately 19-foot-wide base course with an average of 6 inches of aggregate buildup as necessary. Gravel would be laid down when ground conditions are wet enough to cause rutting or other noticeable surface deformation and severe compaction. As a general rule, if vehicles or other project equipment create ruts in excess of 4 inches deep when traveling cross-country over wet soils, a gravel surface would be added prior to additional vehicle use. In areas of very soft soils, up to 3 feet of aggregate would be used during construction.
- Turnouts would be located approximately every 1,000 feet and be mutually visible. Turnout lengths would be 100 feet long with widths of 12- and 21-foot transitions on each end of the turnout.
- Rolling dips would be installed along new access roads in areas of low spots or existing ditches. The rolling dips would be designed to accommodate flows from at least a 25-year storm event. Exact locations of rolling dips are yet to be determined, but would be provided to BLM once the final design is complete.
- The roads would be graded to follow existing topography. Road modifications would be designed to minimize cut-and-fill requirements.
- Applicant shall contact right-of-way holders for location on underground utilities prior to conducting any subsurface activities.

2.1.6 Water Required

Water would be needed for drilling operations, for construction and compaction of roads and pads, and for dust control. Up to 20,000 gallons per day could be required for each observation well throughout the 8-week well-drilling period. Project-related water would be obtained from a water well, preferably from a non-potable water source. The water well would have an estimated depth of up to 500 feet and would be permitted under an Oil and Gas Waiver by the Nevada Division of Water Resources. The groundwater well would be located within the Project Area on a 0.5-acre unpaved pad (150 feet square), located either on an existing well pad or in a separate area within up to ½ mile of one of the proposed access roads, and would have an adjacent reserve pit measuring approximately 50 feet by 15 feet in area and 10 feet deep. Water would be

transported to the geothermal well locations either by aboveground, 8-inch, black polyvinyl chloride (PVC) piping (following the proposed access road routes), or via truck.

As an alternative, water needed for construction and drilling operations could also be purchased and trucked from one or more existing permitted industrial sources in the area such as the Firstgold Corporation Relief Canyon mine located approximately 10 miles northwest of the project site off Buena Vista Road. TGP has also been in discussions with Jim Estill, a rancher who holds water rights to a well located less than 1 mile from the project site to the north. Mr. Estill also holds rights to a water source within the boundaries of lease N-76299. One or more portable water tanks holding a combined total of at least 10,000 gallons, but not more than 60,000 gallons, would be maintained on the well sites during construction.

2.1.7 Aggregate Material Required

The terrain in the areas of the Proposed Action gently slopes toward the north and northwest. Road surfaces would be minimally graded to follow existing topography so no fill material would be required. The well pads would be graded so that cut and fill requirements would be balanced and no offsite fill material would be needed. Any fill material needed would be obtained from excavation of the well pad reserve pit.

Aggregate would be obtained from one of BLM's existing material sites, such as the Fencemaker Gravel Pit or Kitten Springs Pit. TGP would coordinate with the BLM prior to initiating the Proposed Action to assess the capacity of existing resources to meet projected aggregate needs.

Table 3 summarizes the access road and well pad gravel needs of the Proposed Action.

TABLE 3
Access Road and Well Pad Dimensions with Gravel Requirements

	Length	Width (yards)	Average Depth (yards/inches)	Total Gravel (cubic yards)	Total Gravel (cubic yards) Rounded to the Nearest 10
Access roads ^a	11.9 miles (21,006 yds)	6.333	0.167/6	22,216	22,216
Turnouts ^b	4,400 feet (1,467 yd)	4	0.167/6	980	980
Transitions ^c	1,848 ft (616 yd)	4	0.167/6	205.7	206
Observation well pad ^d	36.667 yds	116.667	0.222/8	14,245.1 ^d	14,250
Area Around Well Head ^d	13.333 yds	13.333	0.278/10 (additional)	739.5 ^d	740
Groundwater well pad	50	50	0.167/6	417.5	420
Total					38,812

^aRoad widths of 25 feet (8.333 yards), including 3 feet (1 yard) ungraveled area on each side for surface water drainage. Graveled width would be 19 feet (6.333 yards) and depth would be 6 inches (0.167 yards).

^bAccess roads include turnouts located approximately every 1,000 feet along the main access roads and measuring 12 feet wide by 100 feet long; a total of up to 44 turnouts would be constructed.

^cEach turnout has triangular transition tapers at each end with length 21 ft (7 yd) and base 12 ft.

^dEach observation well pad would measure 350 feet (116.667 yards) x 350 feet (116.667 yards) but only a 350 foot x 110 foot portion of the well pad would be provided with 8 inches (0.222 yards) of gravel. In addition to the 8-inch gravel layer across the 350 foot x 110 foot area, an area measuring 40 feet by 40 feet immediately around each well would require an additional 10 inches (0.278 yards) of gravel for a total of 18 inches. Total cubic yard estimates provided are based on a total of 15 wells.

2.1.8 Work Force and Schedule

TGP proposes to start road construction and drilling activities immediately following BLM approval of the proposed ROW grants and the issuance of other related permits for the project. The road construction, drilling, and testing activities are expected to be completed within 11 months of project initiation. After well operations have ceased or the geothermal lease is released back to BLM, reclamation activities would be conducted as described in Section 2.1.9.

During drilling operations, a camp would be constructed at an inactive well pad to provide accommodations for drill crews and subcontractors. If the initial temporary camp location (well pad) is needed for one of the observation wells, the temporary camp would be moved to a different (inactive) well pad to allow sufficient space for drilling activities. No additional grading would be required to create the camp.

The camp would consist of self-contained trailers used for offices and prefabricated modules (estimated size up to 12 feet by 60 feet) used for lodging facilities. The camp would typically consist of one to two sleeping modules with a centralized kitchen, dining, and recreational area. The components would be brought to the site by trailer along the existing Fencemaker Flat Road and the proposed access roads. The nonpotable water supply for the camp would be supplied from up to two portable water tanks. Drinking water would be bottled water. Sanitary storage tanks would be provided as part of the modules at the laydown area and would be periodically serviced by a commercial service. Electricity would be provided by up to two portable generators.

Communication among field operations, TGP offices, BLM, and NDOM offices, would be maintained with the use of radio and satellite telephones. Support facilities and equipment would be located on the well drilling pad used for the camp.

2.1.9 Site Reclamation

If exploration activities confirm the expected commercial viability of the resource, TGP plans to build and operate a geothermal power plant to generate and sell renewable energy. In that case, TGP would submit an application for regulatory approvals to further develop the wells for production purposes, and to place the associated access roads and other components required to operate the facility into commercial service. The wells would be monitored and exploration activities would continue in accordance with these plans while the application is processed. Interim reclamation activities would be implemented as described below. TGP would reassess the usefulness of wells annually, and if TGP were to judge certain observation wells to be unsuitable for commercial use or monitoring, they would be plugged and abandoned in conformance with the procedures for final reclamation outlined below.

Interim and final reclamation activities proposed in this section are consistent with BLM and NDOM requirements, including recommendations provided in the BLM Gold Book (pages 43-47; BLM, 2007). The Revised Operations Plan submitted to the BLM on October 14, 2010, has additional detail for interim and final reclamation procedures.

2.1.9.1 Interim Reclamation

Disturbed areas in the southern polygon of the Project Area (associated with leases N-86890, N-76300 and N-76299) would undergo interim reclamation within 6 months of completion of flow testing of each well. Disturbed areas in the central polygon of the Project Area (associated with leases N-76299, N-76298 and N-76301) and in the northern polygon of the Project area (associated with leases N-76301 and N-86893) that are not needed for active support of operations would undergo interim reclamation within 3 years of completion of well testing for each well.

During the construction process, topsoil would be salvaged where possible and stockpiled for use during reclamation. TGP would maintain healthy, biologically active topsoil and minimize habitat, visual, and forage loss during the life of the wells by stockpiling and/or spreading any extra salvageable topsoil over the area of interim reclamation whenever possible. Following completion of observation well flow testing, drilling and testing equipment would be removed from the site. To maintain the full extent of the constructed area while still minimizing visual impacts, until the final reclamation stage could be determined, TGP would spread a minimum of 6-8 inches of stockpiled topsoil over the constructed well pad recontoured to an intermediate contour that blends with the surrounding topography. The area would be successfully revegetated to within a few feet of the area required to access and maintain the wellhead. Seeding would be implemented in the fall, October through December.

Surface facilities remaining on site for observation wells would consist of a wellhead and potential monitoring equipment, which would have a matte finish and be painted colors to blend with the natural surroundings. Following completion of testing activities, the well would be fenced, chained, and locked. Wells could be shut-in with a mineral oil cap as applicable. Pressure and temperature sensors could be installed in the well at fixed depths to monitor any changes in these parameters over time. The observation well pads, access roads and reserve basins would be kept in their original position and be subject to regular inspection and maintenance by TGP personnel, until the well is deemed by TGP to be unnecessary or the geothermal lease is released back to BLM. Final reclamation activities for those sites would then be engaged.

The temporary groundwater well would either be abandoned following completion of exploration activities, in accordance with Nevada regulations, or could be converted to permanent use for the facility. If the well is suitable for long-term use, TGP would obtain the necessary permits from the Nevada State Engineer prior to such use.

2.1.9.2 Final Reclamation

Final reclamation would consist of two steps: well reclamation and road reclamation.

Well Reclamation. After well operations have ceased or the geothermal lease is released back to BLM, TGP would reclaim the Project Area by implementing surface reclamation measures and plugging and abandoning the wells in compliance with BLM and NDOM regulations and requirements, including recommendations provided in the Gold Book (pages 43-47; BLM, 2007). A detailed plan for well plugging and abandonment would be addressed in TGP's Application to Drill (Form 3260-3) and Drilling Program. Rolling dips would be removed. Project related equipment and machinery would be decommissioned and, where possible, reused or sold as salvage. Equipment with no resale value would be sold or given as scrap.

The area would be recontoured to blend with the surrounding topography. TGP would resurface wellpads, including reserve pits and residual solids, with stockpiled topsoil where available, and reseed with a mix specified by BLM and free of noxious weeds at the time of reclamation. Topsoil would be respread evenly over the surfaces of the disturbed areas, and erosion-control measures and measures to control invasive non-native plants and noxious weeds would be implemented in accordance with appropriate BLM guidelines. Gravel depth measuring in excess of 8 to 10 inches would be reduced or removed from constructed well pads. The remaining gravel would be topsoiled, ripped and seeded and/or the gravel would be buried deep in the recontoured cut to prevent excess surface exposure. Reserve pits and central sump would be backfilled after they are dry and free of waste and graded to conform to the surrounding terrain.

Road Reclamation. Following completion of project activities, access roads would be reclaimed by recontouring, reseeding, and controlling noxious weeds, unless the BLM requests that the roads remain intact. Project-related equipment and machinery would be decommissioned and, where possible, reused or sold as salvage. Equipment with no resale value would be sold or given as scrap.

TGP would restore the area to the original landform or, if restoration of the original landform is not feasible, recontour to blend in with the surrounding landform. Disturbed areas would be reseeded with a mix specified by BLM at the time of reclamation, and erosion-control measures and measures to control invasive non-native plants and noxious weeds would be implemented in accordance with appropriate BLM guidelines. Other techniques to improve reclamation success could be implemented at BLM's direction.

2.1.10 Environmental Protection Measures

TGP would comply with the stipulations attached to federal geothermal leases N-74854, N-76298, N-76299, N-76300, N-76301, N-86890 and N-86893. TGP also would comply with applicable state and local permit requirements, with any conditions attached to the ROW grants required for improvements of the site access road outside the Lease Area, and ROW grants required between the lease areas. BMPs set forth in the Gold Book (BLM, 2007) would be implemented as described in the relevant resource discussions in Section 4 of this EA.

The following additional environmental protection measures were adopted by TGP for project operations:

- **Air Quality**
 - Post and enforce speed limits to reduce fugitive dust (speed limit of 15 miles per hour, as necessary).
 - Apply dust abatement techniques (such as watering, requiring loader buckets to be emptied slowly, minimizing drop heights, etc.) to earthmoving, excavating, trenching, and grading activities.
 - Minimize equipment and vehicle idling times during construction activities.
- **Fire Resources**
 - All construction and operating equipment would be equipped with applicable exhaust spark arresters.

- Personnel would be trained in fire prevention and initial response, and fire extinguishers would be available at each drill site.
 - Water that is used for construction and dust control would be available for fire suppression.
 - Personnel would be allowed to smoke only in designated areas and would be required to follow applicable BLM regulations regarding smoking.
- **Soils**
 - Erosion control measures, including but not limited to silt fencing, diversion ditches, water bars, temporary mulching and seeding, and application of gravel or rip rap, would be installed, where necessary, immediately after completion of construction activities to avoid erosion and runoff.
 - **Visual Resources**
 - Where practical, lighting would be directional and would be hooded or shielded.

2.2 Alternatives to the Proposed Action

2.2.1 Alternative 1—No Action

The No Action Alternative would require BLM to reject the Proposed Action and not approve geothermal drilling permits. No exploration wells would be drilled and TGP would be unable to evaluate the geothermal power development potential. The No Action Alternative would preclude lease evaluation and the potential for energy production.

2.2.2 Alternative 2

Drilling and other exploration activities in the southern polygon of the project area (leases N-86890, N-76300, N-76299) would be prohibited in order to minimize or eliminate the impacts to traditional cultural properties (TCPs) and traditional routes in the vicinity of the southern polygon, including the NRHP listed Dave Canyon TCP, another unevaluated TCP, and NRHP eligible traditional access routes (CrNV-02-9535 and CrNV-02-9577). Based on consultation with Native American Tribal governments and interested tribal members, adverse impacts would occur if drilling were to take place in the southern polygon of the Project Area. This alternative would be consistent with the Purpose and Need and allow geothermal exploration to proceed as allowed by the terms of the lease while taking into consideration the special lease stipulations to protect the TCPs and the setting of the TCPs.

2.2.3 Alternative 3

Drilling and other exploration activities in the southern polygon of the project area would be restricted to the area north of the road leading to a historic mining area (lease N-76299 and a small portion of lease N-76300). This would minimize the impacts to TCPs and traditional routes in the vicinity of the southern polygon, including the NRHP listed Dave Canyon TCP, NRHP eligible traditional access routes (CrNV-02-9535 and CrNV-02-9577), and another unevaluated TCP. This alternative was viewed by some tribal members as marginally acceptable because it would help protect the setting of the Dave Canyon and another recommended TCP in this vicinity, as well as the setting of NRHP eligible traditional routes CrNV-02-9535 and CrNV-02-

9577). There are alluvial fingers that would help shield exploration activities from the view of the Native Americans utilizing the NRHP eligible traditional routes to access the TCPs, as well as shielding Native Americans utilizing these routes from the view of TGP workers. Exploratory drilling would be restricted to an area north of the road leading to a historic mining area. This alternative would also limit indirect impacts to the NRHP listed and unevaluated TCPs in this vicinity from increased public access because no new roads would be created in this area. This alternative would be consistent with the Purpose and Need and allows geothermal exploration to proceed as allowed by the terms of the lease while taking into consideration the special lease stipulations to protect the TCPs and the setting of the TCPs.

2.2.4 Alternatives Considered But Eliminated.

TGP had originally proposed a new road to access the lease area. This road was approximately 1 mile east of the proposed road. This road would have required new disturbance. One of the primary concerns of the Native Americans was the potential increase of access to the area resulting in increased visitation and consequent impacts to TCPs and sacred sites. Upon further review it was determined that an existing road could be used to provide access to the Project Area, thereby eliminating the need to construct an additional road. No additional resources would be impacted by using the existing road. Therefore this alternative has been considered and eliminated from further analysis.

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Supplemental Authorities and Other Critical Elements

Appendix 1 of BLM's NEPA Handbook (BLM, 2008) identifies resource elements to consider under NEPA and their associated supplemental authorities that contain procedural requirements that BLM must consider as part of its Federal action. The elements are the various resources, such as air quality and biological resources, that could be affected by Federal actions. The supplemental authorities are specified by statutes or executive orders additional to NEPA, such as the Clean Water Act and the Endangered Species Act, which must be considered in all BLM environmental documents.

Table 4 summarizes the resource areas considered critical elements for assessment in this EA, including the supplemental authorities identified in the BLM NEPA Handbook (BLM, January 2009), and identifies those resource areas requiring detailed analysis and those resources for which detailed analysis is not required based on lack of presence for the Proposed Actions (e.g., Areas of Critical Environmental Concern [ACEC], Prime Farmland). For this EA, the critical resource elements are the topics presented in this affected environment section and for which impacts are subsequently analyzed in Section 4.

TABLE 4
Supplemental Authorities (Critical Elements) and Other Resources Affected by the Proposed Actions

Supplemental Authorities (Critical Elements)	Not Present	Present Not Affected	Present Affected	Reference Section	Comments
Air Quality			X	3.2, 4.1, 5.4.1	
Areas of Critical Environmental Concern	X				The Proposed Action is not located in or near any existing ACECs.
Cultural Resources			X	3.3, 4.2, 5.4.2	
Environmental Justice	X				The Proposed Action would be located in an undeveloped, geographically remote area without any existing community or population. There are no environmental justice issues associated with the Proposed Action.
Floodplains	X				There are no Federal Emergency Management Agency (FEMA)-designated 100-year floodplains within the lease area or areas required for ROW.
Invasive, Non-native Species			X	3.4, 4.3, 5.4.3	
Migratory Birds			X	3.5, 4.4, 5.4.4	

TABLE 4

Supplemental Authorities (Critical Elements) and Other Resources Affected by the Proposed Actions

Supplemental Authorities (Critical Elements)	Not Present	Present Not Affected	Present Affected	Reference Section	Comments
Native American Religious Concerns			X	3.6, 4.5, 5.4.5	
Prime or Unique Farmlands	X				There are no farmlands within the lease area boundaries or within areas required for ROW.
Threatened and Endangered Species	X			3.7, 4.6, 5.4.6	There are no federally threatened or endangered species within the lease area boundaries or within areas required for ROW.
Wastes, Hazardous or Solid			X	3.8, 4.7, 5.4.7	
Water Quality (Surface and Ground)			X	3.9, 4.8, 5.4.8	
Wetlands and Riparian Zones			X	3.9, 4.8, 5.4.8	
Wild and Scenic Rivers	X				There are no wild and scenic rivers in the vicinity of the lease area.
Wilderness	X				There are no federally designated wilderness areas within the lease area boundaries.
Other Resources	Not Present	Present Not Affected	Present Affected	Reference Section	Comments
Economic Values			X	3.10, 4.9, 5.4.9	
Fire Resources			X	3.11, 4.10, 5.4.10	
Fisheries Resources	X				There are no fisheries in the vicinity of the leased areas.
Geology and Minerals		X		3.12, 4.11, 5.4.11	
Lands and Realty			X	3.13, 4.12, 5.4.12	
Paleontological Resources			X	3.14, 4.13, 5.4.13	
Range Resources		X		3.15, 4.14, 5.4.14	
Recreation			X	3.16, 4.15, 5.4.15	

Other Resources	Not Present	Present Not Affected	Present Affected	Reference Section	Comments
Soils			X	3.17, 4.16, 5.4.16	
Special-Status Species			X	3.18, 4.17, 5.4.17	
Vegetation			X	3.19, 4.18, 5.4.18	
Visual			X	3.20, 4.19, 5.4.19	
Water Quantity			X	3.9, 4.8, 5.4.8	
Wild Horse and Burro			X	3.21, 4.20, 5.4.20	
Wildlife Resources			X	3.22, 4.21, 5.4.21	

Supplemental Authorities (Critical Elements)

3.2 Air Quality

The Proposed Action would be located in a rural area with minimal industrial sources or potential contribution of emissions to the airshed from vehicle traffic. Activities associated with the Proposed Action would occur in Buena Vista Valley (groundwater basin 129), within Pershing County, Nevada. Groundwater basins in the state of Nevada correspond to airsheds, and therefore groundwater basin 129 is the analysis area for air quality. This basin is in attainment for all National Ambient Air Quality Standards (NAAQS) and Nevada air quality standards. In addition, the area is not a maintenance area for any criteria pollutants.

3.2.1 Regulatory Environment

The U.S. Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards and the Nevada Division of Environmental Protection (NDEP) have set NAAQS and Nevada ambient air quality standards for the following criteria pollutants: nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter smaller than 10 microns in aerodynamic diameter (PM₁₀), particulate matter smaller than 2.5 microns in aerodynamic diameter (PM_{2.5}), ozone, and lead. In addition to the above-listed criteria pollutants, NDEP has established an ambient air quality standard of 0.08 parts per million (ppm) or 112 micrograms per cubic meter for hydrogen sulfide (H₂S). Nevada Administrative Code 445B.22097 provides the minimum standards of quality for Nevada ambient air.

Attainment is achieved when the existing background concentrations for criteria air pollutants are less than the maximum allowable ambient concentrations defined in the NAAQS. The attainment status, with respect to the NAAQs, of the airshed in which the Proposed Action is located precludes the requirement for an air quality conformity analysis.

The Final Mandatory Reporting of Greenhouse Gases Rule issued by the EPA, as signed on September 22, 2009, requires suppliers of fossil fuels or industrial greenhouse gases (GHG), manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions to submit annual reports to the EPA.

3.3 Cultural Resources

Cultural resources include historic and prehistoric sites of interest and may include structures, archaeological sites, or religious sites of importance to Native American cultures. Section 106 of the National Historic Preservation Act (NHPA) as amended (16 USC 40 et seq.) requires federal agencies to take into account the effects of their actions on properties listed or eligible for listing on the NRHP. The National Park Service defines archaeological and historic resources as “the physical evidences of past human activity, including evidence of the effects of that activity on the environment. What makes a cultural resource significant is its identity, age, location, and context in conjunction with its capacity to reveal information through the investigatory research designs, methods, and techniques used by archeologists.” Ethnographic resources are defined as any “site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it” (NPS, 1998).

A Class III cultural resource inventory, CR2-3043(P), of the Project Area was conducted by Far Western during the summer of 2009, and the investigation results have been submitted separately to BLM (Young and Garner, 2010a). In addition, Addendum CR2-3043-2(P) (Young and Garner, 2010b) was completed in April 2010 and includes the results of an inventory of the revised project access route and recordation of two traditional routes identified during Native American consultation. The entire Project Area was inventoried in these cultural resource surveys.

Thirteen cultural resource sites, CrNV-02-8999 through 9009, CrNV-02-9535, and CrNV-02-9577 were identified in the Project Area. (Although CrNV-02-9535 was originally in the project area, the project boundary was subsequently moved to help avoid impacts to the site). Seven of the recorded sites are prehistoric sites with simple flaked stone assemblages. Four cultural resource sites are historic resources and include a transmission line, an underground telephone line, a small-scale mining venture, and a historic residence. Two additional sites, CrNV-02-9535 and CrNV-02-9577, are traditional access routes to the NRHP listed TCP. In addition to the cultural resource sites, 30 isolated finds were recorded, including 25 prehistoric artifacts and five historic items.

The traditional access routes (CrNV-02-9535 and CrNV-02-9577) have been determined by the BLM to be eligible for listing on the NRHP under criteria A (event; making contributions to the broad pattern of American history). CrNV-02-9535 has also been determined to be eligible under criteria D (information potential; property has yielded or may be likely to yield information important to prehistory or history). All of the remaining cultural resources have been determined by the BLM to be not eligible for listing on the NRHP. The Nevada SHPO concurred with these determinations on June 1, 2010.

3.4 Invasive, Non-native Species

CH2M HILL conducted field surveys in the Lease Area on June 30 and July 1, 2009. The State of Nevada lists 47 noxious weed species that require control (Nevada Administrative Code 555.10; Nevada Department of Agriculture, 2008). None of these species was identified during the field survey of the Lease Area and none of the 47 noxious weed species are known to be present on site (Messmer, 2009). However, other invasive, non-native species were identified in the Lease Area including cheat grass (*Bromus tectorum*), Russian thistle (*Salsola kali*), and saltlover (*Halogeton glomeratus*).

3.5 Migratory Birds

Migratory birds are protected and managed under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703 et. seq.) and Executive Order 13186. Under the MBTA, nests (nests with eggs or young) of migratory birds may not be harmed, nor may migratory birds be killed. Executive Order 13186 directs federal agencies to promote the conservation of migratory bird populations. Additional direction comes from BLM Instruction Memorandum 2008-050 (Migratory Bird Treaty Act – Interim Management Guidance), dated December 18, 2007.

All birds in the Winnemucca District are considered neotropical migratory birds except for the gallinaceous (upland game) birds such as California quail (*Lophortyx californicus*), chukar (*Alectoris chukar*), and sage-grouse (*Centrocercus urophasianus*).

The Project Area and surrounding Leased Areas are characterized primarily by salt desert scrub and/or sagebrush vegetative communities. Migratory birds associated with these vegetative communities may include: black-throated sparrow (*Amphispiza bilineata*), Brewer's blackbird (*Euphagus cyanocephalus*), Brewer's sparrow (*Spizella breweri*), burrowing owl (*Athene cunicularia*), canyon wren (*Catherpes mexicanus*), gray flycatcher (*Empidonax wrightii*), green-tailed towhee (*Pipilo chlorurus*), loggerhead shrike (*Lanius ludovicianus*), rock wren (*Salpinctes obsoletus*), sage sparrow (*Amphispiza belli*), sage thrasher (*Oreoscoptes montanus*), western meadowlark (*Sturnella neglecta*), and vesper sparrow (*Pooecetes gramineus*) (Great Basin Bird Observatory, 2003).

The vesper sparrow, loggerhead shrike and western burrowing owl are BLM sensitive species. Several raptors, some of which are BLM sensitive species, may also use the area to forage for food. See section 3.18 for discussion on sensitive species and other special-status species.

Migratory bird species that were identified during the field survey are the black-throated sparrow, common raven, ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*).

3.6 Native American Religious Concerns

Numerous laws and regulations require consideration of Native American concerns. These include the National Historic Preservation Act of 1966 as Amended (NHPA); The American Indian Religious Freedom Act of 1978 (AIRFA) as amended; Executive Order 13007, Indian Sacred Sites; Executive Order 13175, Consultation and Coordination With Tribal Governments; the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) and the Archaeological Resources Protection Act of 1979 (ARPA) as well as NEPA and FLPMA.

There are six traditional cultural properties (TCPs) in the vicinity of the proposed Project Area including one, the Dave Canyon TCP, that is listed on the NRHP. The other TCPs have not been evaluated for the NRHP and therefore must be treated as eligible until they are evaluated. In addition, one traditional route, CrNV-02-9577 passes through the proposed Project Area. Another traditional route, CrNV-02-9535, falls just outside the project boundary. In the NPS publication, “Guidelines for Evaluating and Documenting Traditional Cultural Properties,” Parker and King (1998) define a TCP as follows: “A traditional cultural property, then, can be defined generally as one that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.”

The above TCPs are associated with the pine nut harvest. The use of these specific TCPs was first documented by Heizer in the 1930s. There is also additional information documenting the Native American use of the Stillwater Range dating back to 1861 and including accounts by Sarah Winnemucca. The pine nut harvest was, and continues to be, an important event in the lives of the Northern Paiute. Margaret Wheat wrote, “For the Indians of Nevada, pinenut time was the most important time of the year. Religion was combined with play, work with happiness” (Wheat 1967:2). Unlike most of contemporary American society, traditional Paiutes do not make the distinction between sacred and secular. Traditionally, pine nuts provided a protein-rich food source that could be stored and eaten through the winter. The pine nuts were critical to survival during the harsh winters of the northern Great Basin and were also important trade items for the Lovelock Paiute. The harvest was also a time when people from all over came together to work, play, dance and otherwise interact. Camping for up to months at a time in the mountains amidst the pinyon trees, the pine nut harvest was a joyous time with deep spiritual and cultural significance. Pine nuts assumed a sacred importance in the Paiute culture and many ceremonies were performed to encourage and celebrate a robust crop.

Today local Paiutes value the Stillwater Range not only for the pine nuts they harvest there, but also for the links provided to their past. While the entire Stillwater Range is valued by the Tribes and has for this reason been recommended as an Area of Critical Environmental Concern by the Fallon Tribe, the TCPs are the focal points. Visiting the same places that their ancestors visited for generations, often gathering from the same trees that their ancestors gathered from, these TCPs are considered to be a places of spiritual and cultural regeneration. Nuts are generally harvested in September and October with visits varying from day trips to several days or even a month in rare cases. Overnight camping is common and visits take place even on years when there are no pine nuts.

One of the TCPs, the Dave Canyon TCP, qualified for inclusion on the National Register of Historic Places under Criteria A and D “because of its longstanding association with cultural practices and beliefs of the Lovelock Paiute Tribe” that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community.” The Dave Canyon TCP is important for “carrying on traditional practices such as pinon nut harvesting, hunting, storytelling and tool-making, into the future, and the spiritual uplift and renewal felt by all those who return to the canyon time after time.” Family members of the Dave family from Lovelock, Fallon and other local Tribes as well as traditionalists from these tribes value this TCP for its link to their past and consider it important to continuance of their culture. Additionally it is valued by these tribal members and the Fallon Tribal Government as a sacred site. Native Americans visit this TCP to collect medicines and perform sacred rites.

In order for a site to be listed on the National Register of Historic Places it must also possess integrity. According to the National Register Nomination , “Due to the absence of roads leading into Dave Canyon, the area has maintained its qualities of integrity...[of] location, setting, materials, workmanship, feeling and association. Each of these contributes in a positive manner to the overall significance of the property” (Sec. 8, Page 14). It further states “The canyon and cultural resources associated with pinon nut harvesting camps shows little disturbance since the prehistoric and historic use of Dave Canyon” (Sec. 8, Page 1).

3.6.1 Native American Consultation

BLM WDO initiated Native American consultation with the Lovelock Paiute Tribe, the Fallon Paiute Shoshone Tribe, the Winnemucca Colony, and the Battle Mountain Band Council with letters sent to the tribes on October 26, 2009. Numerous follow-up calls were made to these tribes. The Battle Mountain Band Council and the Winnemucca Colony had no concerns. The Fallon Paiute Shoshone Tribe and the Lovelock Colony requested a site visit/consultation meeting. On December 15, 2009 a consultation meeting was held in Lovelock at the Lovelock Tribal Council Building. Representatives of the Lovelock Colony and the Fallon Paiute Shoshone Tribe, as well as elders and interested tribal members participated. Due to muddy conditions, the proposed exploration site could not be visited that day, although the BLM pointed out the general locality of the Project Area from the road. Subsequent consultations were held with the Lovelock Colony on February 19th 2010 and with the Fallon Tribe on February 24th, 2010. TGP met with the Lovelock Tribal Council on January 28th, 2010 to present their project. BLM also attended this meeting. An ethnographic data gathering site visit was held with tribal elders and interested tribal members from the Lovelock and Fallon Tribes on March 23rd, 2010 and a Native American consultation site visit with representatives of the Fallon Tribe and interested tribal members was held on March 25th, 2010. The Lovelock Tribe was invited to the consultation field trip, but did not attend. An informational meeting occurred with the Fallon Tribe on April 28, 2010, and with users of the TCP and TGP on July 30, 2010. A formal consultation meeting was held with the Fallon Tribal government on July 28th and September 22nd, 2010. A formal consultation meeting was held with the users of the TCPs on September 24th, 2010.

3.7 Threatened and Endangered Species

Pursuant to the requirements of Section 7(c) of the Endangered Species Act, a letter was sent to USFWS on October 13, 2009, requesting information regarding threatened, endangered and candidate species that may occur in the Lease Area. Their response indicated that to the best of their knowledge, no listed, proposed, or candidate species occur in the Project Area.

3.8 Wastes, Hazardous or Solid

No hazardous wastes or hazardous materials are known to occur in the Lease Area. Numerous federal and state laws and regulations have been enacted and are enforced to ensure that hazardous materials, hazardous waste and solid wastes are handled, stored, and disposed of properly.

3.9 Water Quality (Surface and Ground) and Water Quantity

3.9.1 Groundwater

The Proposed Action would be located in the internally drained Buena Vista Valley groundwater basin (Nevada Division of Water Resources [NDWR]-designated administrative groundwater basin 129; Figure 5). The Buena Vista Valley is located in Nevada Hydrographic Region 10 (Central Region) (NDCNR-DWR, 2005), and is in the Great Basin hydrographic area. By Order 732, dated October 2, 1979, the Nevada State Engineer “designated” the Buena Vista Valley groundwater basin, which indicates that the permitted groundwater rights approach or exceed the estimated average annual recharge and the water resources are being depleted or require additional administration (NDCNR-DWR, 2009). Though the basin is a designated basin, most water usage is in the northern part of the valley for agriculture. The Lease Area is in the southern end of the valley, down gradient from other water users.

Buena Vista Valley has an area of 742 square miles and a perennial yield of 10,000 acre-feet per year (AFY). The basin has 28,006 AFY of committed underground water rights and no committed geothermal water rights (NDCNR-DWR, 2009). Groundwater in the Buena Vista Valley occurs in two general waterbearing zones: shallower non-thermal groundwater in alluvial basin fill and deeper, thermal groundwater that occurs in a complex sequence of fractured intrusive and extrusive igneous rocks. Shallow groundwater is anticipated to flow in a generally northwest direction through the Lease Area, from recharge areas in the upland elevations of the Stillwater Range and associated alluvial fans to discharge areas in the playa of Buena Vista Valley. Groundwater flow and recharge mechanisms in the deep thermal groundwater zone are less well-understood; however, shallow groundwater has locally elevated temperatures ranging from 90 to 175 degrees Fahrenheit (°F), which suggests that deep thermal groundwater locally migrates upward through preferential pathways and mixes with shallow groundwater in the basin fill aquifer (Nevada Division of Water Resources, 2009). Vertical migration of thermal water in the Basin and Range Province typically is associated with enhanced permeability caused by rock brecciation along fault zones. The Buena Vista Valley Fault Zone runs along the base of the Stillwater Range on the eastern edge of Buena Vista Valley, and may provide the enhanced vertical permeability needed for deep thermal water to locally rise and mix with the non-thermal shallow groundwater zone (USGS and Nevada Bureau of Mines and Minerals, 2008).

Groundwater quality information in the area is limited due to the relative scarcity of wells in the southern part of the Buena Vista Valley; for example, the Nevada Division of Water Resources (2009) well log database provides records for only six wells in the eleven square-mile sections spanned by the Lease Area, none of which were water production wells but were apparently drilled as test wells for geothermal exploration. Given the similarity in geologic setting, the similarity in precipitation amounts, and the similarity in groundwater recharge and discharge patterns, it is reasonable to assume that the quality of shallow non-thermal and deeper thermal groundwater in Buena Vista Valley is similar to that observed in Dixie Valley, which lies just east of the Stillwater Range. The total dissolved solids (TDS) concentration in shallow alluvial groundwater in Dixie Valley ranges from 900 to 1,900 milligrams per liter (mg/L) according to data tabulated by Karst (1987). Thermal groundwater in the area generally has a higher TDS content; however, the maximum TDS value for thermal groundwater reported by Karst was 1,920 mg/L, essentially the same as the maximum non-thermal groundwater concentration of

1,900 mg/L (Karst, 1987). The geothermal reservoir to be explored in New York Canyon is located up to 10,000 feet below the surface.

3.9.2 Surface Water

Based on analysis of USGS topographic maps and Nevada Division of Water Resources groundwater basin mapping (Figure 5), the Proposed Action would be located in an internally drained desert basin that is a great distance from and lacks hydrographic connectivity to major rivers and water bodies. Therefore, there are no “navigable waters of the U.S.” within Rivers and Harbors Act jurisdiction (as defined by 33 CFR part 329) and no “waters of the U.S.” within Clean Water Act jurisdiction (as defined by 33 CFR 328) in the Lease Area. A letter asking for an approved jurisdictional determination, concurring with this finding was sent to the U.S. Army Corps of Engineers on July 13, 2009. A response is pending.

The USGS 7.5-minute topographic maps of the area (Cornish Peak, Nevada Quadrangle 1987; Logan Peak, Nevada Quadrangle 1990; and Dixie Hot Springs NE, Nevada Quadrangle 1990) show numerous washes flowing northwest out of the Stillwater Range and across the alluvial fan within the Lease Area. Outside of the Lease Area, the washes flow northwest into the playa in the Buena Vista Valley. Some of the smaller washes are ephemeral and only flow from significant rainfall or snowmelt events. Hughes Canyon, Cornish Canyon, and New York Canyon all have washes that flow at least seasonally.

According to the USGS 7.5-minute topographic maps, two ponds and one stock pond are located in the Lease Area, all of which are frequented by cattle. These ponds are at least 2,000 feet up gradient from the proposed area of disturbance. The ponds are associated with washes in sections 11 and 22 of T25N, R35E. The wash in section 22 is fed by the wash flowing out of New York Canyon. The stock pond is located in section 32 of T26N, R36E. Also, one pond and one stock pond are located within a half mile of the Lease Area. The pond is associated with Hughes Canyon in section 27 of T25N, R35E; and the stock pond is in section 7 of T26N, R36E.

Four springs are located up gradient from the Project Area, but within the Lease Area, in sections 1, 14, and 22 of T25N, R35E. Three springs, including Logan Spring, are located in sections 4 and 5 of T25N, R36E; near one another and up gradient, within a half mile of the Lease Area. Most of these springs were observed by field staff conducting archeological surveys nearby, and determined to be cold. The springs that were not observed are anticipated also to be non-thermal and likely discharge meteoric water rather than deep thermal groundwater because of their location on the mountain flanks above the valley floor. Deep thermal groundwater typically discharges near faults along the valley margins. Figure 6 shows spring locations within the Lease Area.

There are no National Wetland Inventory mapped wetlands within the Lease Area (USFWS, 2009); however, small palustrine emergent wetlands could be located in the immediate vicinity of the active washes, ponds, and springs. There are no FEMA Flood Insurance Program Mapping special flood hazard areas or floodway areas within the Project Area (FEMA, 2009).

Other Resources

3.10 Economic Values

The Proposed Action would be located in an undeveloped, geographically remote area without any existing community or population. The closest population centers are Fallon, in Churchill County, and Lovelock, in Pershing County.

The Project Area is approximately 55 linear miles northeast of Fallon and 25 linear miles east-southeast of Lovelock (see Figure 1). Pertinent socioeconomic characteristics of the Project Area are provided in Table 5.

TABLE 5
Socioeconomic Characteristics of the Project Area

Region	Total Population	Housing			Labor			
		Housing Units	Occupied (%)	Median Value of owner-occupied (\$)	Labor Force	Leading Employers	August 2009 Unemployment Data (%)	Per Capita Personal Income
Pershing County	6,291 (2008)	2,389	82.1	82,200	2,478	Management, professional and related industries (22.7%) Service occupation (19.9%) Sales and office industry (18.9%)	10.3	\$20,439 (2006)
City of Lovelock	1,854 (2008)	951	81.8	81,700	917	Service occupation (25.9%) Management, professional and related industries (23.2%) Production, transportation, and material moving occupations (19.9%)	—	—
Churchill County	24,896 (2008)	10,606	83.8	193,000	11,324	Management, professional and related industries (26.5%) Sales and office industry (22.4%); Construction, extraction, maintenance, and repair occupations (17.2%)	9.4	\$35,515 (2006)
City of Fallon	8,525 (2008)	3,336	90	96,000	3,775	Sales and office industry (24.5%); Management, professional and related industries (24.1%) Service occupation (23.3%)	—	—

Source: U.S. 2000 Census Bureau; DETR Research and Analysis Bureau, 2009.

3.11 Fire Resources

Since October 2000 there have been no fires in the vicinity of the Lease Area. There are two fire management units within the New York Canyon Lease Area: Valley and Stillwater. These management units are managed by the BLM Winnemucca District. Several small (less than 10 acres) BLM-controlled burns have occurred in the region.

Churchill and Pershing County Fire Departments would respond to any fires or accidents at the drilling sites. Injured TGP staff or subcontractors would be transported for medical attention by local fire departments, Careflight, or the Fallon Naval Air Station Search and Rescue.

3.12 Geology and Minerals

Buena Vista Valley is a north-northeast/south-southwest-trending elongated valley in west-central Nevada, within the Great Basin Section of the Basin and Range Physiographic Province. The eastern edge of Buena Vista Valley is defined by the Stillwater Range and the western edge is defined by the Humboldt Mountains. Alluvial fans and pediment surfaces flank the area between the mountains and the valley interior. The Proposed Action would be located on a gently-sloped, alluvium-covered surface near the base of the Stillwater Range on the eastern edge of Buena Vista Valley.

Structurally, the Buena Vista Valley is an elongated down-dropped block, or graben, bounded by high-angle faults associated with the Buena Vista Valley fault zone to the east and the Western Humboldt Range fault zone to the west (USGS and Nevada Bureau of Mines and Minerals, 2008). A major earthquake of magnitude 6.8 occurred in 1954 at the base of the Stillwater Range in the adjacent Dixie Valley to the east and created a visible scarp along portions of the west margin of Dixie Valley (Ryall and Vetter, 1982).

The Buena Vista Valley basin is filled with a complex sequence of alluvial, playa, and lacustrine sediments ranging in grain size from clay to gravel. A Phillips Petroleum Company geothermal test well (Log 21949, Nevada Division of Water Resources, 2009) located in T36N, R35E, section 36; penetrated 1,060 feet of valley fill sediments prior to encountering volcanic rocks at a depth of 1,060 feet. The volcanic rocks were described as altered; likely caused by hydrothermal processes given the temperature of water (175°F) noted on the well log. As is common in the Basin and Range Province, the depth to bedrock likely increases toward the center of the Buena Vista Valley, located west of the Lease Area.

Mining claims noted as “active” are located in the vicinity of the Lease Area. A records query for mining claims was run by BLM (2009c) for the following land sections:

- T26N, R36E, sections 20, 21, 28, and 31–33
- T26N, R35E, sections 35 and 36
- T25N, R35E, sections 1-3, 9–12, 14–16, 20–22, 28, 29, and 32
- T25N, E36E, section 6

Of these areas searched, a total of 137 mining claims were returned, all located in T25N, R 35E, for the sections listed in Table 6.

TABLE 6
Mining Claims in the New York Canyon Lease Area

T25N, R35E^a	Claimant	Number of Claims
Section 1 (4 claims)	Saga Exploration Co.	3
	R.A. Bennett	1
Section 2 (10 claims)	Standard Magnesia Co.	2
	Saga Exploration Co.	4
	R.A. Bennett	4
Section 10 (22 claims)	Saga Exploration Co.	13
	R.A. Bennett	3
	David Odt	6
Section 11 (54 claims)	Standard Magnesia Co.	1
	Saga Exploration Co.	33
	R.A. Bennett	12
	David Odt	8
Section 12 (16 claims)	Saga Exploration Co.	11
	R.A. Bennett	3
	David Odt	2
Section 14 (11 claims)	Saga Exploration Co.	6
	David Odt	5
Section 15 (20 claims)	Saga Exploration Co.	11
	R.A. Bennett	5
	David Odt	4

^aData from BLM (2009c). Only T25N, R35E returned lease records in the sections noted.

In addition to mining claims, there are three geothermal leases in effect near the Project Area. These leases are described in section 3.13 (Lands and Realty) along with other land uses authorized for BLM lands, as identified by the BLM Legacy Rehost (LR) 2000 Report System, in the vicinity of the Project Area.

3.13 Lands and Realty

Several ROWs or other authorizations have been granted on public lands within and adjacent to the Project Area. These include ROWs for transmission and telephone lines (fiber optic), roads, and geothermal leases.

A BLM ROW exists just north of the project site for an existing paved road, in addition to a ROW for an existing transmission line owned by NV Energy (formerly Sierra Pacific Power) that runs east to west across the north end of the Project Area, running through T26N, 36E section 28. Just south of this lies a parallel ROW for both AT&T and Nevada Bell for an existing fiber optic line. These ROWs cross T26N, 35E sections 35, 36 and T26N, 36E sections 28, 31, 32, 33 of the leased Project Area.

3.14 Paleontological Resources

An Initial Paleontological Resources Assessment for the Project Area was completed by Dr. Geof Spaulding and submitted to the BLM on November 18, 2009 (Spaulding, 2009). The assessment includes Potential Fossil Yield Classification (PFYC) of the geological units affected by the Proposed Action based on the results of literature searches and records reviews, as well as an analysis of remote imagery of the Project Area. Lease stipulations designate portions of the New York Canyon Project Area as possessing a PFYC of 3a, or moderate potential. IM-2008-009 states that “If a Class 3a (Moderate Potential) unit underlies the area, the local geologic conditions should be considered, as well as any known localities in the region. It may be necessary to consult with...[a] qualified paleontologist to assess the local conditions.” After assessing the local conditions of the New York Canyon Project Area, including a lack of fossil records and lack of sediment types known to consistently yield fossils, it is concluded by Dr. Spaulding, a qualified paleontologist, that the entire Project Area can be assigned a PFYC of 2 (Spaulding, 2009). Sedimentary units that possess low sensitivity are not likely to contain scientifically significant fossils. The assessment concluded that a paleontological field survey of the Project Area was not necessary due to the absence of sediments with unknown or high paleontological sensitivity (PFYC \geq 3).

The Project Area is on the upper bajada of the Stillwater Range immediately below (to the north and west) the piedmont. The coarse Quaternary alluvium and conglomerate that typifies the substrate of the upper bajada of most Great Basin mountain ranges, the Stillwater Range included, typically contains no fossil remains because the environment of deposition is not conducive to fossil preservation. High-energy landslides and flood events that contribute to the build-up of alluvial fans are apt to mechanically degrade organic remains, and surviving material would be left on or near the surface in an oxidizing environment where it would soon decompose. As a consequence, fossils are not found in the proximal portions of the alluvial fans of Great Basin mountains; however, this is not always the case for the toes, or distal portions, of alluvial fans where they can interfinger with lacustrine (lake) or fluvial (river) environments. In such cases, fine-grained strata laid down quickly in anoxic (oxygen poor) sedimentary environments can yield excellently preserved fossils. Review of available remote imagery indicates that these lower bajada environments lie 2 to 4 miles north of the Lease Area, near the bottom of the Buena Vista Valley.

3.15 Range Resources

BLM manages livestock grazing on public rangelands in accordance with the Code of Federal Regulations (CFR) Part 4100 and various BLM Manuals. Public lands designated and managed for livestock grazing are divided into allotments. These allotments are grazed by livestock owned by a rancher (permittee) who controls the base property (ranch) with an attached BLM grazing preference. Grazing Preference is the number of Animal Unit Months (AUMs) attached to a specific base property. An AUM is the amount of forage needed to sustain one cow, five sheep, or five goats for a month. There are no existing range improvements in the Project Area.

The Lease Area lies within the Rochester Allotment, which comprises approximately 254,755 acres (BLM, 2009b). The allotment consists primarily of public and private lands in a “checkerboard” (alternating sections) pattern with small portions of U.S. Bureau of Reclamation (USBR) and U.S. Department of Defense (DoD) property in the southern corner of the allotment. The majority of the public lands are administered by the BLM Winnemucca District Office.

Table 7 displays land ownership in the Rochester Allotment.

TABLE 7
Allotment Ownership

Allotment	BLM (acres)	Private (acres)	USBR (acres)	DOD (acres)	Total (acres)
Rochester	170,823	80,699	3,227	6	254,755

Source: BLM Winnemucca District GIS, 2008

Three BLM grazing permittees are authorized to graze livestock (sheep and cows) in the Rochester Allotment. Table 8 provides more detailed grazing permit information. Permittees A and B graze cows on the lower- to mid-elevation sites in the allotment and Permittee C grazes sheep in the mid- to higher-elevation sites. Livestock graze both public and private lands in the allotment and use a total of 3,177 AUMs during the grazing year (March 1 through February 28).

TABLE 8
Livestock Permit Information

Permit	Livestock #	On Date	Off Date	Animal Unit Months
A	44 cows	4/1	12/31	398
B	138 cows	1/1	10/31	1,379
C	700 sheep	4/1	4/24	111
	537 sheep	3/1	2/28	1,289
Total AUMs				3,177

3.16 Recreation

Recreational use in the Project Area is relatively low compared to other areas in the Winnemucca District, with the majority of visitors likely being residents of Humboldt and Pershing counties. While off-highway vehicle (OHV) use is permissible within the New York Canyon area, recreation is generally limited to seasonal hunting (Carmosino, 2009). The recreational use can be described as “Dispersed Recreation,” indicating that at the present time there are no established trails, campgrounds, or permitted recreational activities that take place in the Project Area. OHV use, auto (4×4) touring, hunting, occasional rock and mineral collecting, and historical/cultural sightseeing and exploring comprise the predominant recreational activities in the Project Area.

3.17 Soils

Soil types in the Lease Area were identified using the NV769 “Pershing County, Nevada, East Part” and NV770 “Churchill County Area, Parts of Churchill and Lyon Counties” soil surveys (USDA Natural Resources Conservation Service [NRCS], 2009).

Eight soil units are present in the Lease Area: 121, 132, 191, 662, 691, 770, 970, and 983 (Figure 7). Roughly 63 percent of the Project Area would be located within soil unit 691 (Chilper-Trocken-Jerval association). Roughly 32 percent would be located within soil unit 132 (Jerval-Knoss-Chilper association). Both of these soil units occur on fan piedmonts between 4,000 to 5,000 feet. The soils generally occur on 2 to 8 percent slopes, are well drained, never flood or pond, and are slightly to strongly saline. The upper soils are generally composed of cobbly or gravelly sandy loam or clay loam. Areas with Chilper soils may occur on 30 to 50 percent slopes. Most of the soils in units 691 and 132 have a slight hazard of off-road or off-trail erosion and are well to moderately suited for natural surface road construction. Some areas with Knoss or Chilper soils may be poorly suited for natural surface road construction due to sandiness, low strength, and slope (USDA NRCS, 2009).

The remainder of the soils in the Lease Area are generally located outside of the Project Area. The soil units east of the Project Area are found in the foothills and mountains and include soil unit 191 (Theon-Singatse association), soil unit 662 (Loomer-Bombadil-Old Camp association), and soil unit 970 (Jobpeak-Teguro-Rock outcrop association). These soils are found on greater than 15 percent slopes, are well drained, and never flood or pond. The soils are generally composed of cobbly, stony, gravelly, or sandy clay loams underlain by unweathered bedrock. These soils generally have severe hazard of off-road or off-trail erosion due to slope and erodibility, and are poorly suited for natural surface road construction due to slope and, in some cases, rock fragments (USDA NRCS, 2009).

Soils on lake plains consist of soil unit 983 (Mazuma-Swigler-Trocken association), while soils on sand sheets consist of soil unit 121 (Hawsley fine sand) and soils on fan piedmonts consist of soil unit 770 (Chilper-Bundorf-Trocken association). These soils are generally well drained and never flood or pond. The lake plain soils are slightly to strongly saline. The surface soil in unit 983 is composed of silt loam or sandy loam, the surface soil in unit 121 is composed of fine sand, and the surface soil in unit 770 is composed of gravelly, sandy, or clay loams. All of these soils have a slight hazard of off-road or off-trail erosion and are well to moderately suited for natural surface road construction (USDA NRCS, 2009).

3.18 Special-Status Species

Nevada Department of Wildlife (NDOW) and Nevada Natural Heritage Program (NNHP) were consulted to identify BLM sensitive and other special-status species with the potential to occur in the Project Area.

NDOW data (diversity data 2007) identified several BLM sensitive bat species within the Lease Area. The search indicated that habitat may exist for the Reese River phacelia (*Phacelia glaberrima*), a plant determined to be vulnerable by the NNHP. Vulnerable species are rare and local throughout their range, have a very restricted range, or are otherwise vulnerable to extinction. The Reese River phacelia is a small annual found on open, dry to moist, alkaline, nearly barren, sometimes scree-covered, whitish to brownish shrink-swell clay soils derived from fluvio-lacustrine volcanic ash and tuff deposits. These soil types could occur in the mountains or foothills of the Lease Area, but are unlikely to be present in the Project Area. This species is generally found on the steeper slopes of low hills, bluffs, and badlands in the shadscale-greasewood, sagebrush, and lower pinyon-juniper zones (NNHP, 2001).

Mines and caves of the Stillwater Range provide roosting habitat for bat species; however, potential roosting habitat is not found in the Project Area. Several BLM sensitive bat species such as western pipistrelle (*Pipistrellus hesperus*), pallid bat (*Antrozous pallidus*), and various myotis species, may use the Project Area for foraging. Lease stipulations for leases obtained in July 2009 also identify the potential presence of Townsend's big-eared bat on these parcels.

The Project Area provides suitable habitat for several BLM sensitive avian species that use open desert habitats. Table 9 shows BLM sensitive avian species, their habitat association, and the species use of the Lease Area. Species distribution and habitat association information is from NatureServe (NatureServe, 2009).

TABLE 9

Sensitive Avian Species, Habitat Association, and Potential Use of Proposed Action Area

Common Name	Scientific Name	Habitat Association	Potential Use of Lease Area
Golden eagle	<i>Aquila chrysaetos</i>	Generally found in open country, especially in hilly or mountainous regions. Nests on rock ledge of cliff or in large trees.	May be found in the Lease Area as a permanent resident.
Burrowing owl	<i>Athene cunicularia</i>	Habitat typified by short vegetation and presence of fresh small mammal burrows. Found in open grasslands and open areas.	May be found in the Lease Area as a breeding resident.
Ferruginous hawk	<i>Buteo regalis</i>	Open country, primarily prairies, plains, and badlands; sagebrush, saltbush-greasewood shrubland, periphery of pinyon-juniper and other woodland, and desert. Nests in tall trees or willows along streams or on steep slopes, in junipers, on cliff ledges, river-cut banks, hillsides, or on mounds in open desert. Generally avoids human activity.	May be found in the Lease Area as a breeding or nonbreeding resident.
Prairie falcon	<i>Falco mexicanus</i>	Primarily open situations, especially in mountainous areas, steppe, plains or prairies. Typically nests in pot hole or well-sheltered ledge on rocky cliff or steep earth embankment.	May be found in the Lease Area as a permanent resident. May nest in the cliff habitats of the Stillwater Range.
Loggerhead shrike	<i>Lanius ludovicianus</i>	During breeding found in open country with scattered trees and shrubs, savanna, desert scrub, and occasionally open woodland.	May be found in the Lease Area as a permanent resident.
Vesper sparrow	<i>Pooecetes gramineus</i>	Habitats include plains, prairies, dry shrublands, savannas, weedy pastures, fields, sagebrush, arid scrub, and woodland clearings. Nests on the ground.	May be found in the Lease Area during the breeding season.

Desert bighorn sheep are present in the Stillwater Range to the east of the Lease Area. Bighorn sheep use steep slopes on or near mountains with a clear view of surrounding areas.

There is no suitable habitat for pygmy rabbits in the Project Area. There are areas of big sagebrush along the outer edges of the eastern Lease Area that could provide habitat for them.

The Project Area does not contain habitat for sage grouse. The outer edge of the Stillwater population management unit (PMU) for sage grouse begins approximately 1 mile from the southern end of the Lease Area and runs the full remaining length of the Stillwater Range.

3.19 Vegetation

A habitat assessment of the Project Area was conducted on June 30 and July 1, 2009. Southwest Regional Gap Analysis Project (SWReGAP) landcover data were supplemented and updated with field observations (CH2M HILL, 2009).

The vegetation within this semi-arid area is controlled primarily by elevation, substrate, aspect, and landform. Vegetation in the Lease Area consists primarily of salt desert scrub in the Project Area and pinyon-juniper woodland in the Stillwater Range. Sagebrush habitats are found at the base of the Stillwater Range in the transition zone between salt desert scrub and pinyon-juniper woodlands.

Dominant vegetation in the salt desert scrub habitats include salt-tolerant species such as shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and four-wing saltbush (*Atriplex canescens*). Other species found scattered in the Project Area include big sagebrush (*Artemisia tridentata*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), iodine bush (*Allenrolfea occidentalis*), Nevada jointfir (*Ephedra nevadensis*), budsage (*Artemisia spinescens*), spiny hopsage (*Grayia spinosa*), broom snakeweed (*Gutierrezia sarothrae*), saltlover (*Halogeton glomeratus*), Indian ricegrass (*Oryzopsis hymenoides*), and cheatgrass (*Bromus tectorum*). Despite its apparent diversity, there is much barren ground between the shrubs, and there is little grass cover. This community extends from the alluvial fans of the Project area onto the slopes of the Stillwater Range.

Pinyon-juniper woodlands occur on the warm, dry slopes of the Stillwater Range and are dominated by a mixture of pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*). Understory layers include curl-leaf mountain mahogany (*Cercocarpus ledifolius*), big sagebrush, and scattered bunch grasses.

Sagebrush shrubland areas contain scattered, isolated big sagebrush; however, these areas also include shadscale, rabbitbrush, Nevada jointfir, spiny hopsage, greasewood, and curl-leaf mountain mahogany. Sagebrush habitats in the Project Area are patchy, open areas with various other shrub species present. No tall, dense stands of pure sagebrush are found in the Project Area.

3.20 Visual Resources

The BLM has initiated the visual resource management (VRM) process to manage the quality of landscapes on public land and to evaluate the potential impacts to visual resources resulting from development activities. VRM class designations are determined by assessing the scenic value of the landscape, viewer sensitivity to the scenery, and the distance of the viewer to the subject landscape. These management classes identify various permissible levels of landscape alteration, while protecting the overall visual quality of the region. They are divided into four levels

(Classes I, II, III, and IV). Class I is the most restrictive and Class IV is the least restrictive in terms of changes that are allowed to the characteristic landscape (BLM, 1986).

The proposed project site is located within a Class IV visual resource management category. The objective for this class is to provide for management activities that allow major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. Activities in a Class IV category may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Route 857 is a maintained road that runs northeast-southwest approximately 8 miles west of the Lease Area. The closest sensitive receptor (park, church, residence, school, hospital, etc.) is located in Lovelock, Nevada, approximately 25 miles west-northwest of the Project Area.

A VRM study was commissioned by the project proponent and CH2M HILL (2010). The study was done to see what visual effects the proposed action had on the view from the Dave Canyon TCP. Three Key Observation Points (KOPs) were chosen by the BLM and the proponent. The first KOP was from an old mining road between two TCPs, the second KOP was from within the Dave Canyon TCP, and the third was from a peak inside the Dave Canyon TCP. The primary photographs for the study were taken in July; unfortunately it was overcast the day when the photographs were taken.

Computer modeling techniques were used by CH2M HILL to prepare the visual simulations. Two simulations for each KOP point were modeled depicting the drilling and post-drilling periods. The drilling period simulations represent the 2 month period for each exploration well containing the sumps, well pads, and access roads, plus the drilling infrastructure including drill rigs, temporary worker camps, water storage tanks, trucks, and other equipment. The post-drilling period simulations illustrate the period when all drilling has been completed and the equipment removed, but the sumps, well pads, access roads, well heads and fences are still in place. The post-drilling period simulations illustrate the period before interim reclamation has been initiated.

The VRM study, for all three KOPs, finds that there is only a weak degree of contrast during the daytime when the drilling infrastructure is on the well pads. At night though, the drill rig lighting would cause visual impacts from KOPs 2 and 3. Once the drilling equipment is removed, the well pads would create a weak contrast in the viewshed during the daytime.

It bears noting, that there are some limitations to the VRM study. First, having been done on a cloudy day, the contrast is subdued due to the lack of illumination. VRM assessments, while using a rigorous methodology are qualitative and subjective. Finally, there is no formal guidance for integrating VRM studies into the NRHP process.

As noted by Parker and King (1998:4), evaluation of integrity and feeling issues for TCPs requires involvement of the TCP users. Consultation and informational meetings with the users of the Dave Canyon TCP found that the well pads and drill rigs in the visual simulations do produce adverse impacts. The well pads and drill rigs would ruin their view of the valley and mar their cultural landscape. For the users, they look out at the valley and it is a reminder of the world that was and helps maintain the feeling of the past when they are at the TCP. For them, the view of the valley is one that the Paiute people have shared for hundreds to thousands of years.

The placement of drill rigs and well pads into the area would be a reminder of the 21st century. This destroys their positive view of the area, and instead produces a sense of sadness and loss. The TCP users thought the pictures of the interim reclamation did not contain adverse visual effects.

3.21 Wild Horse Management

The Lease Area is located almost entirely within the North Stillwater Herd Management Area (HMA), which straddles the Churchill/Pershing County line (BLM, 2009a). A total of 132,428 acres of the HMA are located in the Winnemucca District Office area and 49,240 acres are within the Carson City Field Office area. Although the HMA includes 10 allotments, only four allotments accommodate horses. Wild horses in this HMA spend the winter and most of the spring months on the west side of the Stillwater range in the vicinity of Logan Spring and Big Ben Canyon. As weather warms, the herd moves up to higher elevations. The appropriate management level for wild horses in the HMA is from 121 to 201 horses.

3.22 Wildlife Resources

Wildlife typical of Great Basin habitats may be found in the Proposed Action area. This includes large mammal species such as Desert Bighorn sheep (*Ovis Canadensis nelsoni*) and mule deer (*Odocoileus hemionus*), which can be found in the Stillwater Range immediately east of the Project Area. Pronghorn antelope (*Antilocarpra americana*), black-tailed jackrabbit (*Lepus californicus*), coyote (*Canis latrans*), and badger (*Taxidea taxus*) could be expected in or near the Project Area. Various small common mammals, primarily rodents and common reptiles may also be found in the area. Nearby (within ½ mile) caves, rock crevices, and historic mines provide shelter for bats that likely forage in the area.

Biological surveys, including a habitat assessment and general wildlife observations of the Project Area were conducted on June 30 and July 1, 2009 (CH2M HILL, 2009). Species observed in the area during these surveys included various bird species, pronghorn antelope, western whiptail (*Aspidoscelis tigris*), and western fence lizard (*Sceloporus occidentalis*).

Section 3.7 addresses federally listed threatened and endangered species. Section 3.18 presents information on special-status species.

4.0 ENVIRONMENTAL CONSEQUENCES

Two alternatives were developed through Native American Consultation. There would be virtually no change in impacts disclosed under other resources by carrying the alternatives through all the sections for resources other than cultural and Native American Religious Concerns.

Supplemental Authorities (Critical Elements)

4.1 Air Quality

4.1.1 Proposed Action

Air emissions from the Proposed Action would be generated primarily from the following air pollution sources:

- Heavy equipment and drill rig (diesel exhaust and GHG emissions)
- Earth moving and grading (particulate fugitive and GHG emissions)
- Observation well testing (H₂S and GHG emissions)

Fugitive dust emissions during construction and from construction vehicles using the access roads would result in temporary emissions of particulate matter, but these emissions would be of larger particulate sizes and the majority of these fugitive particulate emissions would settle before leaving the Lease Area. Because the proposed total disturbed area is greater than 5 acres, the NDEP Bureau of Air Pollution Control (BAPC) requires a Surface Area Disturbance Permit and corresponding Dust Control Plan.

Short-term construction and drill rig exhaust emissions, including volatile organic compounds, carbon monoxide, nitrogen dioxide, PM₁₀, hazardous air pollutants, oxides of sulfur, and GHG emissions such as carbon dioxide would result from internal combustion engines including heavy equipment engines used at the construction site. The magnitude of these short-term fugitive emissions is so low as to not require a permit from NDEP BAPC.

Small quantities of naturally occurring non-condensable gases, such as H₂S and GHGs (carbon dioxide, and minor amounts of methane) would be emitted to the air during observation well testing. H₂S initial concentrations in New York Canyon area geothermal fluids are estimated at approximately 70 ppm, and methane concentrations are estimated at less than 2 percent of non-condensable gases, based on historical data from the nearby Dixie Valley geothermal facility.

It is anticipated that up to 15 observation wells, up to 10,000 feet deep, would be drilled and tested. Flow testing would be conducted for an average of 3 days (24 hours per day), for each well. It is anticipated that the initial flow rates of fluid from each well into its reserve pit and to the central sump would be approximately 500 to 1,500 gallons per minute on average (with up to 700,000 lbs/hr geothermal flow) depending upon the productivity of the well. Based on this estimate, total potential emissions from the proposed observation well testing would be approximately 26.4 tons H₂S (1.76 tons per well).

Because potential H₂S emissions would be greater than 5 tons per year, and well testing would last less than 1 year, the Proposed Action would require a temporary air permit to comply with state air quality regulations. Additionally, and consistent with the Occupational Safety and Health Administration Safety and Health Regulations (Title 29, CFR, Section 1910.1 to

1910.1500), a hydrogen sulfide monitoring system would be on the drill rigs, the mud tanks, and shaker system to protect workers.

Cumulative GHG emissions from both observation well testing and construction-related diesel engines were reviewed and determined to be less than 25,000 tons per year and thus less than the trigger for federal reporting requirements. Additionally, per State of Nevada regulations, only electrical generating power plants are required to report GHG emissions. Therefore, the Proposed Action would not be required to report GHG emissions.

4.1.2 Mitigation Measures

To minimize the potential for impacts to air quality from the Proposed Action, TGP would implement the following measures:

4.1.2.1 Lease Stipulations

No lease stipulations apply to air quality.

4.1.2.2 Applicant Proposed Environmental Protection Measures

To minimize air pollution emissions from exploration activities, TGP would use the following mitigation measures and BMPs:

- Surface access roads with aggregate materials, wherever appropriate.
- Post and enforce speed limits to reduce fugitive dust (speed limit of 15 miles per hour, as necessary).
- Apply dust abatement techniques to earthmoving, excavating, trenching, and grading activities (such as watering, requiring loader buckets to be emptied slowly, minimizing drop heights, etc.).
- Minimize equipment and vehicle idling times during construction activities.

4.1.2.3 BLM-Recommended Additional Mitigation Measures

No additional mitigation measures have been recommended.

4.1.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, air quality would not change from existing conditions.

4.2 Cultural Resources

4.2.1 Proposed Action

Two traditional routes, CrNV-02-9535 and CrNV-02-9577, have been determined to be eligible for listing on the NRHP under criteria A. CrNV -02-9535 has also been determined to be eligible under criteria D. The project boundary has been adjusted so that one of the traditional routes (CrNV-02-9535) is outside of the Project Area. The traditional route CrNV-02-9577 is within the Project Area. There could be direct adverse impacts to these sites from proposed project disturbances and cross country travel. Since these routes pass through and are directly adjacent to the project area, there could also be impacts to the integrity of setting of these routes from the proposed exploration activities. Implementation of the proposed action could also result in incremental impacts to cultural resources in the project area vicinity due to increased access to

previously remote areas. If the mitigation measures listed in section 4.2.2 are implemented, these impacts would be reduced and/or limited to short-term impacts. Impacts to TCPs in the vicinity of the project are addressed in the Native American Religious Concerns section.

The remaining eleven cultural resource sites identified during the cultural resource inventory have been determined to be not eligible for NRHP. Therefore no impacts to these sites are anticipated from the proposed project.

4.2.1.1 Alternative 2

Under this alternative, drilling in the southern polygon of the Project Area would be prohibited and therefore impacts to NRHP eligible traditional access routes (CrNV-02-9535 and CrNV-02-9577) are not anticipated. Impacts to the setting of these routes would be greatly reduced. Archeological sites in the vicinity of the southern polygon would be less likely to be subject to damage. If the mitigation measures listed in section 4.2.2 are implemented, impacts would be reduced and/or limited to short term impacts.

4.2.1.2 Alternative 3

Under this alternative, drilling and other exploration activities in the southern polygon of the Project Area would be restricted to the area north of the road to the abandoned mine shaft located on lease N-76299 and on a small portion of lease N-76300. This alternative would minimize the impacts to NRHP eligible traditional access routes (CrNV-02-9535 and CrNV-02-9577). Although this would allow some road building and exploration in part of the southern polygon, there are alluvial fingers (ridges) between the existing road and the NRHP eligible traditional routes that would help shield exploration activities from the view of the Native Americans utilizing the traditional routes to access the TCPs. Additionally, it would help shield from the view of TGP workers, Native Americans utilizing these routes to access TCPs. If the mitigation measures outlined in section 4.2.2 are implemented, there would only be temporary impacts to the integrity of the setting of these routes. Impacts to cultural sites in the vicinity would be anticipated to be less than under the proposed action, but more than under Alternative 2. If mitigation measures in section 4.2.2 are implemented, these would be reduced.

4.2.2 Mitigation Measures

To minimize the potential for impacts to cultural resources from the Proposed Action, TGP would implement the following measures:

4.2.2.1 Lease Stipulations

The Proposed Action will comply with Section 106 of the National Historic Protection Act (NHPA).

4.2.2.2 Applicant Proposed Environmental Mitigation Measures

No additional mitigation measures are proposed.

4.2.2.3 BLM-Recommended Additional Mitigation Measures

Proposed Action

- TGP would provide training to all onsite employees on the importance of protecting cultural resources and the consequences of any violations.

- Crews would be required to stay within the project site as needed to perform their duties. This would not preclude crew members from travelling to and from the project site.
- Signage would be implemented to indicate that access roads to the project are “no through traffic”.
- The traditional roads identified as CrNV-02-9535 and CrNV-02-9577 would not be utilized by TGP.
- Provide a 50 meter avoidance buffer on each of the traditional roads identified as CrNV-02-9577 and CrNV-02-9535. All disturbance would be 50 meters away from these traditional routes.
- TGP would not block access for the Native Americans to CrNV-02-9577 and CrNV-02-9535, nor put any impediments along these two routes which would prohibit travel by the Native Americans. Allow Native Americans access to TCPs and sacred sites. TGP would also not block Native American access to the road running along the ridge of the Stillwater range.
- TGP would restrict project traffic from utilization of traditional routes (CrNV-02-9535 and CrNV-02-9577).
- TGP would not conduct any off-road or cross-country travel. All vehicular travel must be on roads built or maintained by TGP.
- Well pads in the southern leases (N-86890, N-76300, and N-76299) would be successfully re-vegetated within six months after drilling and flow testing. Re-seeding would be done using weed free and BLM approved seed mixtures.
- All non-emergency construction and drilling would be prohibited in the southern leases (N-86890, N-76300, and N-76299) during September and October. If the pine-nut season extends into November, drilling and construction would be prohibited during that month. Each year, through consultation with the tribes and TCP users, the BLM would determine if the pine nut season extends into November.
- All exploratory drilling would be done within 3 years.
- A traffic counter has been installed on the traditional route into the Dave Canyon TCP. The BLM and the proponent would monitor traffic along this road monthly. If there is a significant rise in the use of the road, gates would be installed at the entrance road to TGP’s operation.

Alternative 2

- Restrict project traffic from utilization of traditional routes (CrNV-02-9535 and CrNV-02-9577).
- Allow Native Americans access to TCPs and sacred sites.
- All well pads and access roads would be reclaimed within three years of completion of exploratory drilling. Wells would be plugged and abandoned, and well pads recontoured and

successfully re-seeded with a BLM approved seed mix. A reclamation plan would be submitted to the BLM for approval prior to final reclamation.

- TGP would provide training to all onsite employees on the importance of protecting cultural resources and the consequences of any violations.
- Crews would be required to stay within the project site as needed to perform their duties. This would not preclude crew members from travelling to and from the project site.
- Signage would be implemented to indicate that access roads to the project are “no through traffic”.
- A traffic counter has been installed on the traditional route into the Dave Canyon TCP. The BLM and the proponent would monitor traffic along this road monthly. If there is a significant rise in the use of the road, gates would be installed at the entrance road to TGP’s operation.

Alternative 3

- Restrict project traffic from utilization of traditional routes (CrNV-02-9535 and CrNV-02-9577).
- Allow Native Americans access to TCPs and sacred sites.
- Well pads in the southern leases (N-76300, and N-76299) would be successfully re-vegetated within six months after drilling. Re-seeding would be done using weed free and BLM approved seed mixtures.
- Construction and drilling would be prohibited in the southern leases (N-76300, and N-76299) during September and October. If the pine-nut season extends into November, drilling and construction would be prohibited during that month. Each year, through consultation with the tribes and TCP users, the BLM would determine if the pine nut season extends into November.
- All other well pads and access roads would be reclaimed within three years of completion of exploratory drilling. Wells would be plugged and abandoned, and well pads recontoured and successfully re-seeded with a BLM approved seed mix. A reclamation plan would be submitted to the BLM for approval prior to final reclamation.
- A traffic counter has been installed on the traditional route into the Dave Canyon TCP. The BLM and the proponent would monitor traffic along this road monthly. If there is a significant rise in the use of the road, gates would be installed at the entrance road to TGP’s operation.
- TGP would provide training to all onsite employees on the importance of protecting cultural resources and the consequences of any violations.
- Crews would be required to stay within the project site as needed to perform their duties. This would not preclude crew members from travelling to and from the project site.
- Signage would be implemented to indicate that access roads to the project are “no through traffic”.

4.2.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, the disturbance or effects associated with the Proposed Action would not occur.

4.3 Invasive, Non-native Species

4.3.1 Proposed Action

The Proposed Action has the potential to increase the spread of invasive, non-native species. Weed seeds can germinate when soils are disturbed by construction activities, particularly where available soil moisture is increased by application of water for dust suppression. Weeds could also be introduced by construction equipment brought to the project from infested areas or by the use of seed mixtures or mulching materials containing weed seeds.

4.3.2 Mitigation Measures

The potential for the Proposed Action to increase the spread of invasive, non-native species would be minimized through the reclamation procedures described as part of the Proposed Action in section 2.9.1 and the following mitigation measures:

4.3.2.1 Lease Stipulations

During all phases of development, TGP shall maintain a noxious weed program consisting of monitoring and eradication for species on the Nevada Designated Noxious Weed List (NRS 555.010). With implementation of these measures, no long-term impacts associated with invasive, non-native species are anticipated.

4.3.2.2 Applicant Proposed Environmental Protection Measures

- Avoid or treat existing weed infestations prior to disturbance
- Map and treat areas that become infested during construction
- Use certified weed-free seed and mulching materials

4.3.2.3 BLM-Recommended Additional Mitigation Measures

No additional mitigation measures are recommended.

4.3.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, the spread of invasive and non-native species associated with the Proposed Action would not occur.

4.4 Migratory Birds

4.4.1 Proposed Action

Approximately 82 acres of migratory bird habitat would be disturbed or lost as a result of implementing the Proposed Action. Human activity and increased noise from construction and drilling in the Project Area could temporarily displace migratory birds. However, large tracts of similar habitat are found adjacent to the Project Area and migratory birds would likely return to the area after construction.

4.4.2 Mitigation Measures

To minimize the potential for impacts to migratory birds from the Proposed Action, TGP would implement the following measures:

4.4.2.1 Lease Stipulations

Surface disturbing activities during the migratory bird nesting season (April through July) may be restricted in order to avoid potential violation of the Migratory Bird Act.

The Migratory Bird Treaty Act (MBTA) and stipulations of the geothermal leases held by TGP address requirements related to ground-disturbing activities during the migratory bird nesting season. In order to meet these requirements, either habitat for migratory birds would be eliminated within areas of proposed disturbance prior to the nesting season, or migratory bird nest surveys would be conducted no more than two weeks prior to surface disturbing activities by a qualified biologist acceptable to the BLM. This survey would be conducted to identify either breeding adult birds or nest sites within the specific areas to be disturbed. If active nests are present within these areas to be disturbed, TGP would coordinate with the BLM to develop appropriate protection measures for these sites, which may include avoidance, construction constraints, and/or the establishment of buffers.

4.4.2.2 Applicant Proposed Environmental Protection Measures

To minimize impacts to migratory birds and other wildlife, in addition to the management practices described above, wells and roads would be recontoured and reseeded following completion of the Proposed Action as described in section 2.1.9. Erosion-control measures would be implemented as described in section 4.16.2. Topsoil would be salvaged and reused whenever possible and in a timely manner as described in section 2.1.9.

4.4.2.3 BLM-Recommended Additional Mitigation Measures

No additional mitigation measures are recommended.

4.4.3 No Action Alternative

Project features would not be constructed under this alternative; therefore, the disturbance or effects associated with the Proposed Action would not occur.

4.5 Native American Religious Concerns

4.5.1 Proposed Action

4.5.1.1 Native American Concerns

As a result of Native American consultation efforts, a number of concerns were expressed by tribes as well as by tribal elders and other interested tribal members. In general, the concerns focused on direct and indirect adverse impacts to the integrity of setting and feeling of the Traditional Cultural Properties (TCPs); adverse impacts to two traditional routes to the TCPs; indirect impacts to the TCPs, sacred sites and archeological sites from increased access and visitation by the public, and by workers associated with the project. Concerns were expressed that because of these adverse impacts, they would experience loss of their connection to their culture with consequent impacts on elders and youth, and the continuance of their culture. They emphatically stressed that they were a living people and had not gone away. Other concerns expressed were: jobs (including monitoring) for Native Americans; impacts to springs and geothermal resources; impacts to their access to TCPs and sacred sites; non-enforcement of mitigation measures; concerns that geothermal energy might not stay in Nevada; and increased potential for fire and loss of valued pinyon. While many concerns were expressed, some tribal representatives and members welcomed possible job and job training opportunities and local

economic benefits associated with the development of a geothermal plant. In general, all consulted were in favor of geothermal energy, but many had concerns about exploration and development in this spot. A number of mitigation measures were discussed with the tribes and TGP. These mitigation measures have been incorporated into this EA in section 4.5.2.

When shown the visual simulations, users of the Dave Canyon TCP expressed concerns over the visual impacts. For them, they come to the TCPs to re-connect with nature and their traditional ways of living. Seeing the well pads out in the valley destroys the atmosphere of connecting with their past—the well pads are reminders of the 21st century. Further discussion of the visual impacts to the TCPs is in section 3.20.

The Fallon Tribe and interested Tribal members from the Fallon and Lovelock tribes preferred that there would be no drilling or geothermal development in the entire project area. Their next preferred alternative was that there would be no drilling in the southern polygon of the project area. Some interested tribal members found limited drilling in the northern tip of the southern polygon project area marginally acceptable if discussed mitigation measures were implemented. No official opinion was stated by the Lovelock Tribal Council. Elders of the Lovelock Colony voiced opinions similar to that of the Fallon Tribal government.

4.5.1.2 Impacts of Proposed Action

In accordance with 36 CFR 800.5(a) “In consultation with the SHPO/Tribal Historic Preservation Officer (THPO) and any Indian tribe or Native Hawaiian organization that attaches religious and cultural significance to identified historic properties, the agency official shall apply the criteria of adverse effect to historic properties within the area of potential effects.” According to 36 CFR 800.5(a)(1) “An adverse effect is found when an undertaking may alter directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, material, workmanship, feeling, or association.” According to “Guidelines for Evaluation and Documenting Traditional Properties” adverse effects include “introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting”. For the purposes of this EA, an adverse effect constitutes an adverse impact.

The landscape of the Dave Canyon TCP, including Buena Vista Valley is currently relatively unaltered by modern developments. There is an abandoned mining prospect near the Dave Canyon TCP, and the area is also part of a grazing allotment. The leases surrounding the Dave Canyon TCP are not part of a landscape that receives much traffic or other human activity on a daily basis. The Proposed Action would introduce visual (drill rigs, drill pads, wells, roads, vehicle traffic, man camp and other disturbances), audible (equipment and vehicle noise) and atmospheric (dust associated with vehicle traffic and operations) intrusions that are out of character with the TCP and would adversely affect the integrity of setting and feeling of the Dave Canyon TCP. Since integrity setting and feeling are part of the qualities that make this TCP eligible for listing on the NRHP, this constitutes an adverse effect and an adverse impact. Tribal members visit this TCP not only to harvest pine nuts, but for “spiritual uplift and renewal” and “maintaining the continuing cultural identity of the community.” The Dave Canyon TCP is also a considered a sacred site. Tribal members collect medicines and perform sacred rituals there. It further needs to be stressed, since exploration activities would most likely be going on in the fall when the pine harvest is ongoing, impacts to the integrity of setting and feeling of the TCP would occur. Visual simulations of the drill pads in the southern leases also indicate that there

will be visual impacts. The simulations also suggest that impacts will be minimized if reclamation is begun as soon as possible. The presence of the drill rigs and crews could deter tribal members from even going up to the TCPs to gather pine nuts and participate in the associated activities.

There could also be indirect adverse effects to the Dave Canyon TCP due to increased and improved access. The Dave Canyon TCP is currently protected by its remoteness and relatively poor access. According to the National Register Nomination for Dave Canyon, “Due to the absence of roads leading into Dave Canyon, the area has maintained its qualities of integrity...[of] location, setting, materials, workmanship, feeling and association. Each of these contributes in a positive manner to the overall significance of the property” (Sec. 8, Page 14). The nomination further states, “The canyon and cultural resources associated with pinon nut harvesting camps shows little disturbance since the prehistoric and historic use of Dave Canyon” (Sec. 8, Page 1).

Proposed new and improved roads in the southern polygon of the Project Area could make the Dave Canyon TCP more accessible and exploration activities could draw more attention to the area, leading to potential impacts to the TCP from dispersed recreation. Potential impacts include damage to and/or destruction of traditional camps, archeological sites and sacred sites. 36 CFR 800.5(2)(i) cites “Physical destruction of or damage to all or part of the property” as an adverse effect. Other potential impacts include additional impacts to the integrity of setting and feeling of the TCP from dispersed recreation. Even if the proposed roads are reclaimed at the end of the exploration activities, once acquainted with the area, recreationists may continue to utilize the area.

The mitigation measures listed in section 4.5.2 would be sufficient to mitigate the adverse effects to the Dave Canyon TCP, other TCPs in the vicinity of the project area, and the two traditional access routes (CrNV-02-9535 and CrNV-02-9577) from the Proposed Action. If these mitigation measures are implemented, the adverse effects can be limited to short-term, temporary impacts. No long-term impacts are anticipated.

4.5.1.3 Alternative 2

Under this alternative drilling in the southern polygon of the Project Area would be prohibited and; therefore, impacts to TCPs and traditional routes in the vicinity of the southern polygon, including the NRHP listed Dave Canyon TCP, another unevaluated TCP, and NRHP eligible traditional access routes (CrNV-02-9535 and CrNV-02-9577) would not occur. Because there would be no new or improved roads in this portion of the Project Area, indirect impacts from potential increased visitation to the Dave Canyon TCP, as well as to one other unevaluated TCP in the vicinity of the southern polygon are not anticipated. Nor would impacts to the integrity of setting of these TCPs and traditional access routes occur. As under the Proposed Action, effects to the other TCPs are anticipated to be temporary and minimal if mitigation measures listed in section 4.5.2 are implemented.

4.5.1.4 Alternative 3

Under this alternative, drilling and other exploration activities in the southern polygon of the Project Area would be restricted to the area north of the road to the abandoned mine shaft located on lease N-76299 and on a small portion of lease N-76300. This alternative would minimize the impacts to TCPs and traditional routes in the vicinity of the southern polygon including the

NRHP listed Dave Canyon TCP, another unevaluated TCP, and NRHP eligible traditional access routes (CrNV-02-9535 and CrNV-02-9577). Although this would allow some road building and exploration impact of the southern polygon, there are alluvial fingers (ridges) between the existing road and the NRHP eligible traditional routes that would help shield exploration activities from the view of the Native Americans utilizing the traditional routes to access the TCPs. Therefore, no impacts to the integrity of setting of these routes are anticipated. Additionally, it would help shield from the view of TGP workers, Native Americans utilizing these routes to access TCPs. If the mitigation measures outlined in section 4.5.2 are implemented, and all project related disturbances are reclaimed at the end of exploration, there would only be temporary impacts to the integrity of the setting of the Dave Canyon TCP and other TCPs. These temporary impacts are from drilling and road building at the north end of the southern polygon. This alternative would greatly reduce effects to the setting of the Dave Canyon and another TCP in the vicinity. Since no new roads would be created in the southern polygon, potential indirect effects to these TCPs and associated sacred sites would be reduced under this alternative. This alternative would limit potential public access to this area. As under the Proposed Action and alternative 2, effects to other TCPs located in the vicinity of the northern and central polygons are anticipated to be temporary and minimal if the mitigation measures identified in section 4.5.2 are implemented.

This alternative was viewed by some tribal members as marginally acceptable because it would help protect the setting of the Dave Canyon TCP as well as the setting of NRHP eligible traditional routes CrNV-02-9535 and CrNV-02-9577. The tribal members who find this alternative acceptable feel that if development occurs in this northern tip of the southern polygon, it would be far enough away from the NRHP listed TCP. Temporary effects could still occur to the other NRHP eligible TCPs near the central and northern polygons.

4.5.2 Mitigation Measures

To minimize the potential for impacts to Native American Religious Concerns from the Proposed Action, TGP would implement the following measures:

4.5.2.1 Lease Stipulations

Lease numbers N-74854, N-76298, N-76299, N-76300, and N-76301 include the following stipulations: “Further development, including exploration, in Potentially Valuable Area (PVA) #12 (New York Canyon and surrounding area), cannot take place unless additional environmental analysis concludes that such development would not have an adverse effect on Traditional Cultural Properties (TCPs)” and “Further development, including exploration, in the New York Canyon KGRA and adjacent noncompetitive lease application areas, cannot take place unless additional environmental analysis concludes that such development would not have an adverse effect on Traditional Cultural Properties (TCPs)”.

Older leases stipulate that there must be no surface occupancy within the setting of NRHP eligible TCPs where integrity of the setting is critical to their eligibility.

Lease number N-86893 and N-86890 include the following stipulation: “No surface occupancy in or near TCPs or sacred sites”.

4.5.2.2 Applicant Proposed Environmental Protection Measures

No additional mitigation measures are proposed.

4.5.2.3 BLM-Recommended Additional Mitigation Measures

Proposed Action:

- Provide a 50 meter avoidance buffer on each of the traditional roads identified as CrNV-02-9577 and CrNV-02-9535. All disturbance would be 50 meters away from these traditional routes.
- TGP would not block access for the Native Americans to CrNV-02-9577 and CrNV-02-9535, nor put any impediments along these two routes which would prohibit travel by the Native Americans. Allow Native Americans access to TCPs and sacred sites. TGP would also not block Native American access to the road running along the ridge of the Stillwater range.
- Restrict project traffic from utilization of traditional routes CrNV-02-9535 and CrNV-02-9577.
- Well pads in the southern leases (N-86890, N-76300, and N-76299) would be successfully re-vegetated within six months after drilling. Re-seeding would be done using weed free and BLM approved seed mixtures.
- All other well pads and access roads would be reclaimed within three years of completion of exploratory drilling. Wells would be plugged and abandoned, and well pads recontoured and successfully re-seeded with a BLM approved seed mix. A reclamation plan would be submitted to the BLM for approval prior to final reclamation.
- All non-emergency construction and drilling would be prohibited in the southern leases (N-86890, N-76300, and N-76299) during September and October. If the pine-nut season extends into November, drilling and construction would be prohibited during that month. Each year, through consultation with the tribes and TCP users, the BLM would determine if the pine nut season extends into November.
- No construction or drilling would be allowed within ¼ of a mile of a boundary of a known TCP.
- No overland travel would be allowed outside of the approved disturbance areas.
- TGP would not use any water from the seasonal creeks emanating from Hughes Canyon, Dave canyon, New York Canyon, Logan Canyon, and Big Ben Canyon. TGP would not use any water from the stock pond in their lease area. TGP would conduct monitoring of the local springs.
- All exploratory drilling would be done within 3 years.
- A traffic counter has been installed on the traditional route into the Dave Canyon TCP. The BLM and the proponent would monitor traffic along this road monthly. If there is a significant rise in the use of the road, gates would be installed at the entrance road to TGP's operation.

- TGP would pay for removal of tamarisk/salt-cedar in Dave Canyon by the end of the exploratory drilling phase. The BLM will determine the best method for removal in consultation with the TCP users.

Alternative 2

- Restrict project traffic from utilization of traditional routes CrNV-02-9535 and CrNV-02-9577.
- Allow Native Americans access to TCPs and sacred sites.
- All well pads and access roads would be reclaimed within 3 years of completion of exploratory drilling. Wells would be plugged and abandoned, and well pads recontoured and successfully re-seeded with a BLM approved seed mix. A reclamation plan would be submitted to the BLM for approval prior to final reclamation.
- No construction or drilling would be allowed within ¼ of a mile of a boundary of a known TCP.
- TGP would provide training to all onsite employees on the importance of protecting cultural resources and the consequences of any violations.
- Crews would be required to stay within the project site as needed to perform their duties. This would not preclude crew members from travelling to and from the project site.
- Signage would be implemented to indicate that access roads to the project are “no through traffic”.
- A traffic counter has been installed on the traditional route into the Dave Canyon TCP. The BLM and the proponent would monitor traffic along this road monthly. If there is a significant rise in the use of the road, gates would be installed at the entrance road to TGP’s operation.

Alternative 3

- Restrict project traffic from utilization of traditional routes CrNV-02-9535 and CrNV-02-9577.
- Allow Native Americans access to TCPs and sacred sites.
- Well pads in the southern leases (N-76300, and N-76299) would be successfully re-vegetated within six months after drilling. Re-seeding would be done using weed free and BLM approved seed mixtures.
- Construction and drilling would be prohibited in the southern leases (N-76300, and N-76299) during September and October. If the pine-nut season extends into November, drilling and construction would be prohibited during that month. Each year, through consultation with the tribes and TCP users, the BLM would determine if the pine nut season extends into November.
- No construction or drilling would be allowed within ¼ of a mile of a boundary of a known TCP.

- All other well pads and access roads would be reclaimed within 3 years of completion of exploratory drilling. Wells would be plugged and abandoned, and well pads recontoured and successfully re-seeded with a BLM approved seed mix. A reclamation plan would be submitted to the BLM for approval prior to final reclamation.
- TGP would pay for removal of tamarisk/salt-cedar in Dave Canyon by the end of the exploratory drilling phase. The BLM would determine the best method for removal in consultation with the TCP users.
- TGP would provide training to all onsite employees on the importance of protecting cultural resources and the consequences of any violations.
- Crews would be required to stay within the project site as needed to perform their duties. This would not preclude crew members from travelling to and from the project site.
- Signage would be implemented to indicate that access roads to the project are “no through traffic”.
- A traffic counter has been installed on the traditional route into the Dave Canyon TCP. The BLM and the proponent would monitor traffic along this road monthly. If there is a significant rise in the use of the road, gates would be installed at the entrance road to TGP’s operation.

4.5.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, the disturbance or effects associated with the Proposed Action would not occur.

4.6 Threatened and Endangered Species

4.6.1 Proposed Action

No threatened or endangered species are known to exist in the Lease Area; therefore, no impacts would occur as a result of implementing the Proposed Action.

4.6.2 No Action Alternative

No threatened or endangered species are known to exist in the Lease Area; therefore, no impacts would occur with the No Action Alternative.

4.7 Wastes, Hazardous or Solid

4.7.1 Proposed Action

Diesel fuel, lubricants, hydraulic fluids and drilling chemicals (drilling mud, caustic soda, barite, etc.), would be transported to, stored on, and used in the Project Area during exploration activities (Table 10). The project must conform to both federal and state requirements for handling these hazardous materials. Typical of most construction projects, the storage and use of these materials could result in minor, incidental spills of diesel fuel or oil during fueling of equipment, filling of fuel storage tanks, and handling lubricants. Other incidental spills could be associated with equipment failures such as ruptured hoses.

Small quantities of solid wastes (paper, plastic, and other garbage) generated by the Proposed Action would be transported offsite to an appropriate landfill facility. Portable chemical toilet wastes would be removed by a local contractor.

Small quantities of hazardous waste would be generated by construction operations. Typically these wastes would be in the form of empty drums or spent lead acid batteries used for construction equipment. Construction activities typically generate waste oils, oily rags, and oil-impregnated absorbent materials used to clean up minor spills from construction equipment. However, most waste generated from the construction activities would be solid (non-hazardous) waste.

TABLE 10
Approximate Quantities of Common Materials and Chemicals Used During Well Drilling

Product	Quantity Used	Quantity Stored
Drilling Mud Gel (Bentonite Clay)	334,000 lbs	100 lb sacks on pallets
Salt (NaCl)	134,000 lbs	50 lb sacks on pallets
Barite (BaSO ₄)	20,000 lbs	50 lb sacks on pallets
Tannathin (Lignite)	4,200 lbs	50 lb sacks on pallets
Lime (Calcium Hydroxide)	3,400 lbs	50 lb sacks on pallets
Caustic Soda (Sodium Hydroxide)	1,700 lbs	50 lb sacks on pallets
Diesel Fuel	54,000 gals	6,000 gal tank
Lubricants (Motor Oil, Compressor Oil)	1,700 gals	55 gal drums
Hydraulic fluid	400 gals	55 gal drums
Anti-Freeze (Ethylene Glycol)	220 gals	55 gal drums
Liquid Polymer Emulsion (partially hydrolyzed polyacrylamide / polyacrylate (PHPA) copolymer)	170 gals	5 gal buckets

Well stimulation operations may involve placing a dilute mixture of hydrochloric (muriatic) acid down the well. The amount of dilute acid placed in the well bore (which can vary from 10,000 to 50,000 gallons or more) is determined by calculating the amount of each type of mineral to be dissolved. Concentrated (35 percent) hydrochloric acid is trucked to the site and mixed on site with water by experienced contractors. The dilute acid mixture is placed in the cased well bore, followed by water to push the mixture into the geothermal reservoir. After dissolving the minerals in the geothermal reservoir, the water and now spent acids are flowed back through the well to the surface where they are tested, neutralized if necessary (using sodium hydroxide, crushed limestone or marble), and discharged to the well pad reserve pit.

4.7.2 Mitigation Measures

To minimize the potential for impacts associated with hazardous or solid wastes from the Proposed Action, TGP would implement the following measures:

4.7.2.1 Lease Stipulations

Prior to exploration and development, an emergency response plan will be developed that includes contingencies for hazardous materials spills and disposal.

4.7.2.2 Applicant Proposed Environmental Protection Measures

- The hazardous material spill and disposal contingency plan would be submitted to and approved by the BLM and made readily available on site before operations begin.
- Secondary containment structures would be provided for all chemical and petroleum/oil storage areas during drilling operations. Additionally, absorbent pads or sheets would be placed under likely spill sources and spill kits would be maintained on site during construction and drilling activities to provide prompt response to accidental leaks or spills of chemicals and petroleum products.
- Handling, storage, and disposal of hazardous materials, hazardous wastes, and solid wastes would be conducted in conformance with federal and state regulations to prevent soil, groundwater, or surface water contamination and associated adverse effects on the environment or worker health and safety.

4.7.2.3 BLM-Recommended Additional Mitigation Measures

No additional mitigation measures are recommended.

4.7.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, disturbance associated with the Proposed Action would not occur.

4.8 Water Quality (Surface and Ground) and Water Quantity

4.8.1 Proposed Action

As described in section 2.1.5 roads would be constructed as part of the Proposed Action. Roads and wells would be located and designed to avoid impacts to surface water features such as springs, ponds, and ephemeral washes to the extent possible.

Well testing would involve removing thermal groundwater and discharging it to the drill pad reserve pit and to the central sump. Excess fluids from each well would be trucked or piped to the central sump. The central sump, designed to receive excess thermal water produced during observation well testing, would have a variable thickness of clay lining resulting from discharge of bentonite drilling fluids to the sump. The anticipated test flow rates (500 to 1,500 gallons per minute) and durations (average of 3 days) may result in 2 to 6 million gallons of thermal groundwater being extracted from the geothermal aquifer for each well during testing. Installation and testing of deep geothermal wells has the potential to cause impacts on surface water through accidental release of geothermal fluids to surface water features. Although unlikely, there is a potential for hydrologic connection between the geothermal aquifer and the aquifer that feeds surface water features such as springs. In order to prevent a release of geothermal fluids to surface water features, drilling muds and geothermal fluids would be contained in the well pad reserve pit or piped or trucked to the large central sump when quantities dictate.

The geothermal aquifer and shallow groundwater aquifer are not believed to be hydrologically connected except in localized areas where preferential pathways may have formed associated with historical tectonic activity, allowing deeper geothermal fluids to rise and mix with shallower non-thermal groundwater and/or discharge to the ground surface as hot springs. However, it is not possible to categorically exclude this possibility based on available data. If there were a hydrologic connection between the geothermal aquifer and shallow groundwater, then temperature or quantity of spring water could be affected through the withdrawal of geothermal fluids during drilling and well testing. To avoid or minimize these impacts, BMPs for well installation and testing would be implemented as described below. In addition, a monitoring plan would be put in place to assess whether impacts to quality, quantity, or temperature of surface water occurred as a result of observation well installation and testing.

Project-related water would be obtained from a water well, preferably from a non-potable water source to be installed with an estimated depth of up to 500 feet and permitted under an Oil and Gas Waiver by the Nevada Division of Water Resources. Although the Buena Vista Valley groundwater basin is a designated basin, most water usage is in the northern part of the valley. The Lease Area is in the southern end of the valley, down gradient from other water users. Groundwater extraction in this area would not affect existing water users.

4.8.1.1 Surface Water and Groundwater Monitoring Plan

As the boreholes for groundwater and observation wells are advanced, the depth of aquifers (non-thermal and thermal) penetrated during drilling would be noted. If possible, an assessment of whether the aquifer is confined or unconfined would be made, as well as an estimate of aquifer thickness and a qualitative assessment of its relative productivity. The temperature of penetrated aquifers would be noted.

No direct or indirect impacts are expected on riparian or wetland areas associated with washes, ponds, or springs, because construction activities would avoid these areas.

4.8.2 Mitigation Measures

The release of hazardous materials to the environment could affect surface water features. Measures to prevent such a release, including development of a construction Stormwater Pollution Prevention Plan (SWPPP) and spill prevention, control, and countermeasures (SPCC) plan, are described in section 4.8.2. Similarly, erosion could affect surface water quality. Erosion-control measures would be implemented as described in section 4.16.2. In addition to these measures, the following steps would be undertaken during construction to avoid or minimize the potential for impacts to surface water or groundwater in the area:

4.8.2.1 Lease Stipulations

- Lease stipulations for all leased areas included in the Proposed Action prohibit surface occupancy, including well pad disturbance or construction, within 650 feet (horizontal measurement) of any surface water bodies, riparian areas, wetlands, playas, or 100-year floodplains unless specifically approved by the BLM.
- Lease stipulations for all leased areas included in the Proposed Action require development of a hydrologic monitoring program. This program would include documentation of subsurface information including the number of aquifers encountered, their properties, their quality, and their saturated thickness, for submittal to the BLM.

4.8.2.2 Applicant Proposed Environmental Protection Measures

- In addition, the following hydrologic data would be collected:
 - From springs to be identified in consultation with the BLM: Representative temperature and flow rate – once immediately prior to the commencement of drilling and once immediately following the completion of drilling; and once per year until all wells have been abandoned where feasible. At a minimum, due to Native American concerns, testing would be done on the seasonal creeks emanating from Big Ben Canyon, Dave Canyon, Hughes Canyon, Logan Canyon and New York Canyon.
- During drilling or flow testing of selected observation wells, to be identified in consultation with the BLM: Representative temperature and flow rate once each week until drilling, flow testing or water extracting is completed.
- When permanent new access roads must cross ephemeral washes, rolling dips would be installed. The rolling dips would be designed to accommodate flows from at least a 25-year storm event. Culverts may be used wherever rolling dips are not feasible.
- Excavation into native soil during construction of the well pad reserve pit and central sump would be minimized to the maximum extent possible.
- Settled bentonite clay from drilling mud would accumulate on the bottom of the drill pad reserve pits and central sump to act as an unconsolidated clay liner, reducing the potential for drilling fluid to percolate to groundwater.
- A BLM-approved grouting and casing program for construction of observation wells would be implemented to prevent water quality effects on groundwater during or after well installation.
- Borehole geophysics analyses (cement bond logs) would be conducted to document that well casing grouting activities provide an effective seal isolating the geothermal aquifer from shallow alluvial aquifers, therefore minimizing potential impacts on surface springs or streams.
- The project would use BMPs to ensure that any geothermal fluid encountered during the drilling does not flow uncontrolled to the surface. These include the use of “blow-out” prevention equipment during drilling and the installation of well casing cemented into the ground.
- TGP would obtain necessary working in waters and/or groundwater discharge permits and provide a Notice of Intent to NDEP BWPC prior to well pad construction.
- TGP would submit a GDP application, including detailed drilling and casing procedures, to BLM for approval prior to initiating geothermal drilling.

4.8.2.3 BLM-Recommended Additional Mitigation Measures

No additional mitigation measures have been recommended.

4.8.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, water quality or water quantity would not change from existing conditions.

Other Resources

4.9 Economic Values

4.9.1 Proposed Action

The construction/drilling workforce for the Proposed Action would comprise up to 12 workers per well with up to three wells being drilled at one time. Construction is anticipated to occur 24 hours a day, 7 days a week, during the period November, 2010 to November, 2013. Some of the workforce would be recruited locally (estimated 3 or 4); however, most would be specialized workers from outside of the local area. Non-local skilled workers would be housed in a camp on the project site.

Due to the short-term nature of the Proposed Action and the relatively low number of required workers, the Proposed Action would not induce population growth in either Churchill or Pershing counties. Additionally, the Proposed Action would not create any infrastructure that would promote substantial population growth.

Non-local construction/drilling workers would add to the local economies of Churchill and Pershing counties due to anticipated worker expenditures on entertainment, food, gas, and other supplies. In addition, TGP would likely purchase or rent some portion of the equipment and supplies for the project (such as grading equipment, fuel, and tools) from local suppliers.

4.9.2 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, economic values would not change from existing conditions. The local economic benefit of hiring, local purchases, and worker expenditures associated with the Proposed Action would not occur.

4.10 Fire Resources

4.10.1 Proposed Action

Implementation of the Proposed Action would increase the potential for human caused fires during construction and drilling activities. Accidental discharge during transportation and storage of flammable materials or chemicals (such as fuel) could accelerate the ignition of fires in the project site. Impacts from these fires would vary based on fire size. Development of a hazardous material handling, storage and transportation plan would reduce the potential for fires (see section 4.7). TGP has proposed environmental protection measures to further reduce the potential for human caused fires. The BLM would be informed as soon as possible of all fires that occur within the Lease Area during construction, drilling, and testing. Use of fire control mitigation measures would result in minimal impact to fire resources.

4.10.2 Mitigation Measures

4.10.2.1 Lease Stipulations

No lease stipulations apply to fire resources.

4.10.2.2 Applicant Proposed Environmental Protection Measures

- All construction and operating equipment would be equipped with applicable exhaust spark arresters.
- Personnel would be trained in fire prevention and initial response, and fire extinguishers would be available at each drill site.
- Water that is used for construction and dust control would be available for fire suppression.
- Personnel would be allowed to smoke only in designated areas and would be required to follow applicable BLM regulations regarding smoking.

4.10.2.3 BLM-Recommended Additional Mitigation Measures

- All flammable materials would be stored and used in accordance with all federal, state and local laws.

4.10.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, there would be no impact to fire resources.

4.11 Geology and Minerals

4.11.1 Proposed Action

A history of recent (1954) seismicity and the presence of hot springs on the surface of the Dixie Valley fault zone led Ryall and Vetter (1982) to indicate that Dixie Valley, located on the eastern edge of the Stillwater Range that forms the eastern boundary of Buena Vista Valley, would have a relatively high potential for induced seismicity if injection of geothermal fluids into deep wells occurs. Seismic activity along the Dixie Valley fault zone has occurred far more recently (i.e., within the past century) than the late Quaternary activity along the Buena Vista Valley fault zone (USGS and Nevada Bureau of Mines and Minerals, 2008). The potential for induced seismicity in the Buena Vista Valley fault zone is not known; however, because the Proposed Action would not involve injecting fluids into the observation wells, induced seismicity would not be expected to occur related to exploration activities.

4.11.2 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, disturbance associated with the Proposed Action would not occur.

4.12 Lands and Realty

4.12.1 Proposed Action

The only current ROWs within the Project Area vicinity are an existing AT&T fiber optic telephone line, a Nevada Bell fiber optic line and a power transmission line use, which generally follow an existing graveled road just north of the project site. This ROW would be used only for access to the Project Area. The Proposed Action would not include drilling or other exploration activities in the ROW. The use of the lands for geothermal development would not preempt the other current uses of the land identified in Section 3.13.

4.12.2 Mitigation Measures

To minimize the potential for impacts to lands and realty from the Proposed Action, TGP would implement the following measures:

4.12.2.1 Lease Stipulations

- No drilling would be conducted within linear Rights-of-Way.

4.12.2.2 Applicant Proposed Environmental Protection Measures

- Applicant would contact right-of-way holder for location on underground utilities.

4.12.2.3 BLM-Recommended Additional Mitigation Measures

- General Terms and Conditions would be made part of the ROW grant (see Appendix B).

4.12.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, lands and realty would not change from existing conditions.

4.13 Paleontological Resources

4.13.1 Proposed Action

Under the Proposed Action, potential effects to paleontological resources could occur during the well drilling, reserve pit, and central sump excavation phase of the project, but not during well testing. Subsurface disturbance would occur during construction of drilling pads and installation of wells. Subsurface disturbance would not occur in stock pile areas or as a result of overland travel routes. The area affected by the Proposed Action is underlain by coarse Quaternary alluvium that has been designated as possessing a PFYC of 2, or low paleontological sensitivity. PFYC 2 sediments are unlikely to contain vertebrate or scientifically significant invertebrate fossils. While fossils may be present in sediments designated PFYC 2, the chance of encountering them is very low to nonexistent. Therefore, the Proposed Action would not have adverse effects on paleontological resources.

4.13.2 Mitigation Measures

To minimize the potential for impacts to paleontological resources from the Proposed Action, TGP would implement the following measures:

4.13.2.1 Lease Stipulations

- Lease numbers N-86890 and N-86893 have stipulations classifying these lease areas as possessing a PFYC of 3, and identifying the potential requirement for inventory and/or on-site monitoring during disturbance. Based on additional review, BLM concurs with the conclusion reached in (Spaulding, 2009) that these lease areas possess a PFYC of 2 and no field inventory or on-site monitoring will be required.
- Lease stipulations require that, in the event that previously undiscovered paleontological resources are discovered in the performance of any surface disturbing activities, the item(s) or condition(s) would be left intact and immediately brought to the attention of the authorized officer of the BLM.

4.13.2.2 Applicant Proposed Environmental Protection Measures

No additional mitigation is proposed by the Applicant.

4.13.2.3 BLM-Recommended Additional Mitigation Measures

No additional mitigation measures are recommended.

4.13.3 No Action Alternative

Under the No Action Alternative no subsurface ground disturbance would occur and, as a result, paleontological resources would not be affected.

4.14 Range Resources

4.14.1 Proposed Action

The Proposed Action would disturb about 82 acres, which is a very small percentage of approximately 254,755 acres within the allotment. All proposed activities are located away from sources of water and would not prevent livestock access to available water sources in the Project Area. To prevent access by cattle to areas which might be harmful to them, TGP has committed to fence pits in conformance with the Gold Book, and has not proposed any project activities which would substantially limit livestock's access to the undisturbed portions of the operations area.

Due to the small disturbance of the Proposed Action and livestock's access to the undisturbed portions of the operations area impacts to range resources would be minimal. There would be no reduction in authorized grazing as a result of the Proposed Action.

4.14.2 No Action Alternative

The Project features would not be constructed if the No Action Alternative is selected, so there would be no impacts to range resources.

4.15 Recreation

4.15.1 Proposed Action

Recreation in the Project Area vicinity is generally limited to seasonal hunting. OHV use is permitted, but the area is not actively managed by the BLM to facilitate recreational use and the area is characterized as a unit with no identifiable market demand for structured recreation opportunities (BLM, 2008b).

While there would be the occasional inconvenience of increased traffic caused by development activities associated with the Proposed Action, implementation of the Proposed Action would not prevent continued access by recreational users of the adjacent public lands. Because recreation in the area is so dispersed, no adverse impacts are anticipated from development activities associated with the Proposed Action.

4.15.2 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, recreation opportunities would not change from existing conditions.

4.16 Soils

4.16.1 Proposed Action

In the Lease Area, the hazard of off-road or off-trail soil erosion ranges from slight to severe; however, most of the Project Area have a slight hazard of off-road or off-trail erosion because the terrain is gentle (less than 8 percent slopes). Areas with steeper slopes have moderate to severe hazard of off-road or off-trail soil erosion. However, none of the proposed facilities would be constructed in areas with steeper slopes. The soils in the lease area range from poorly to well-suited for natural surface road construction. Most of the soils within the Project Area are moderately to well-suited for natural surface road construction. Small portions of the Lease Area with steep slopes, sandiness, and low strength may be poorly suited for natural surface road construction (USDA NRCS, 2009). Because project facilities would be located primarily in areas with a slight hazard for erosion, the Proposed Action would have limited impact on soil erosion.

The loss of soil productivity is expected to be low because the soils have low native fertility and no prime or other important farmlands, as covered under the Farmland Protection Policy Act (Public Law 97-98, 7 USC 4201), are present within the Lease Area.

The release of hazardous materials to the environment could affect soil resources. BMPs to prevent such a release, including development of a SPCC plan, are described in section 4.8.

4.16.2 Mitigation Measures

Erosion and loss of soil productivity would be minimized by implementing the following measures during access road and well pad construction:

4.16.2.1 Lease Stipulations

- Lease stipulations for all leased areas included in the Proposed Action prohibit surface occupancy, including well pad disturbance or construction, on areas with slopes greater than 40 percent.
- The lease stipulates controlled surface use for the protection of erosive soils and soils on slopes greater than 30 percent. Erosion control measures would be employed on soils with greater than 30 percent slopes and those with severe or very severe erosion classes.
- Wells and roads not required for development purposes would be re-contoured to blend with the surrounding topography, in accordance with lease stipulations.

4.16.2.2 Applicant Proposed Environmental Protection Measures

- Excavation into native soil during construction of well pad reserve pits and central sump would be minimized to the maximum extent possible.
- Topsoil would be salvaged and reused whenever possible and in a timely manner.
- Temporarily disturbed areas would be reseeded where previously vegetated using a BLM approved seed mixture.
- Erosion control measures, including but not limited to silt fencing, diversion ditches, water bars, temporary mulching and seeding, and application of gravel or rip rap, would be

installed, where necessary, immediately after completion of construction activities to avoid erosion and runoff.

- Access roads would follow existing contours to the maximum extent possible. In areas where new access roads must be constructed across slopes, erosion control measures would be installed as necessary, in accordance with Gold Book standards (BLM, 2007).
- An average of 6 inches of gravel would be used as road surface because roads would be used during all seasons. Up to 3 feet of gravel may be used on some sections of road and no gravel would be used on road sections where the natural surface is adequate.
- Additional gravel would be laid down when ground conditions are wet enough to cause rutting or other noticeable surface deformation and severe compaction. As a general rule, if vehicles or other project equipment create ruts in excess of 4 inches deep when traveling cross-country over wet soils, the soil shall be deemed too wet for vehicle use, without the application of a gravel surface.
- If construction occurs in areas of very soft soils, up to 3 feet of aggregate would be used.
- An NDEP BAPC Surface Area Disturbance (SAD) permit documenting the best practical management practices to be used, would be required for the project because the surface disturbed by the project would be greater than 5 acres.

4.16.2.3 BLM-Recommended Additional Mitigation Measures

No additional mitigation measures have been recommended.

4.16.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, there would be no change to soil resources from current conditions.

4.17 Special-Status Species

4.17.1 Proposed Action

The Reese River phacelia may have potential habitat on the steep slopes of the Stillwater Range; however, these areas would not be disturbed by construction or drilling activities. Therefore, no impacts to Reese River phacelia are expected as a result of implementation of the Proposed Action.

No sensitive bat roosting habitat is expected to be disturbed due to implementation of the Proposed Action. However, approximately 82 acres of potential foraging habitat for sensitive bat species could be disturbed by construction of access roads and wells. These bat species are insectivorous and it is not expected that insect populations would be adversely affected by construction activities. There are large tracts of similar habitat in the vicinity of the Project Area for bats to forage; therefore, minimal impacts to sensitive bat species are anticipated.

In the Lease Area, resident BLM sensitive species and breeding sensitive avian species would lose approximately 82 acres of habitat as a result of the Proposed Action. Indirect effects from noise and increased human activity could temporarily displace and reduce breeding success of these sensitive avian species; however, the species would likely return to the area upon completion of ground-disturbing activities. Since there are large tracts of similar habitat in the

vicinity of the Project Area, impacts are expected to be minor. Bighorn sheep habitats within the Stillwater Range would not be directly affected by construction or drilling activities. Bighorn sheep are known to move to lower elevations when temperatures are low or when forage is covered in snow. They often seek relative warmth, especially south and west-facing slopes of foothills. Bighorn sheep may be affected indirectly by human activity and noise in that they may avoid the foothills near the Lease Area and seek areas of similar low elevation habitat away from disturbance. Impacts to bighorn sheep are expected to be minor.

The Project Area does not contain habitat for sage grouse. The outer edge of the Stillwater population management unit (PMU) for sage grouse begins approximately 1 mile from the southern end of the Lease Area and runs the full remaining length of the Stillwater Range. No impacts to sage grouse are anticipated.

No pygmy rabbit habitat exists within the Project Area. There may be pygmy rabbits present within the outer edges of the eastern Lease Area. If there, they may be indirectly affected by the increased human activity and noise but it is expected to be a slight impact.

4.17.2 No Action Alternative

Project features would not be constructed under this alternative; therefore, the disturbance or effects associated with the Proposed Action would not occur.

4.18 Vegetation

4.18.1 Proposed Action

Approximately 82 acres of salt desert scrub vegetation would be disturbed as a result of implementing the Proposed Action. Direct impacts to vegetation would result from clearing and grading for new access roads and well pads. Site clearing or grading or other ground-disturbing activities would result in direct impacts to vegetation by crushing and indirect impacts from soil compaction and the potential introduction of invasive vegetation. These impacts are considered temporary. Compacted soil, especially in salt desert scrub, may be affected for a longer period, which may limit reclamation success. However, the salt desert scrub community has a wide and common regional distribution. No decrease in any plant population or community below self-sustaining levels would occur as a result of implementing the Proposed Action.

4.18.2 Mitigation Measures

Direct impacts to vegetation would be minimized by implementing the following measures during access road and well pad construction:

4.18.2.1 Lease Stipulations

- Wells and roads not required for development purposes would be re-contoured to blend with the surrounding topography and using appropriate methods to seed with diverse perennial “certified” weed free seed mix.

4.18.2.2 Applicant Proposed Environmental Protection Measures

- Impacts to vegetation would be minimized by reseeding all areas of access roads and well pads not required for subsequent energy production using weed-free and BLM-approved seed mixtures (Table 11). TGP would consult with BLM regarding the timing of reseeding, specific seed mixtures, and application rates to be used to improve the success of reseeding.

Disturbed areas would be re-contoured to blend with the surrounding topography. Topsoil would be salvaged whenever possible and reused in a timely manner.

TABLE 11
Proposed Seed Mix

Species	PLS lbs./acre	Bulk lbs./acre	PLS/sq. ft.
Fourwing saltbush	3.00	5.00	4
Shadscale	3.00	5.00	4
Indian ricegrass	1.00	1.25	4
Forage kochia	0.50	0.75	5
Totals	7.50	12.00	17

Note: PLS = Pure Live Seeds

4.18.2.3 BLM-Recommended Additional Mitigation Measures

No additional mitigation measures have been recommended.

4.18.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, clearing and grading associated with the Proposed Action would not disturb the salt desert scrub vegetation in the Lease Area.

4.19 Visual Resources

4.19.1 Proposed Action

Temporary impacts to visual resources would occur during road and well pad construction activities in the Project Area and as a result of the presence of drill rigs. Roads, drill pads, and laydown areas would be near ground level and would not affect visual resources. Construction impacts would be minor and short-term and would be consistent with Class IV VRM objectives.

During the drilling operations, the drill rig could extend up to about 175 feet above ground level. These operations would be conducted 24 hours per day, 7 days per week. The rig would be visible at distances of greater than 1 mile from the drill site, and lights used when drilling at night would increase rig visibility.

As noted in sections 3.6 and 4.5, for Native Americans, the Proposed Action and recommended mitigation measures would produce short-term, temporary adverse visual impacts to the Dave Canyon TCP.

Access roads would remain after the wells have been drilled as described in Section 2.1.5.

4.19.2 Mitigation Measures

To minimize the potential for impacts to visual resources from the Proposed Action, TGP would implement the following measures:

4.19.2.1 Lease Stipulations

No lease stipulations apply to visual resources.

4.19.2.2 Applicant Proposed Environmental Protection Measures

- Well heads would be painted a color that blends with the surrounding area, as approved by the BLM.
- All drill rig and well test facility lights would be limited to those required to safely conduct the operations, and would be shielded and/or directed in a manner that focuses direct light to the immediate work area.

4.19.2.3 BLM-Recommended Additional Mitigation Measures

- Surface facilities remaining on site for observation wells would have matte finishes.
- Disturbed areas in the southern polygon of the Project Area (associated with leases N-86890, N-76300 and N-76299) would undergo interim reclamation within 6 months of completion of flow testing of each well. Disturbed areas in the central polygon of the Project Area (associated with leases N-76299, N-76298 and N-76301) and in the northern polygon of the Project area (associated with leases N-76301 and N-86893) that are not needed for active support of operations would undergo interim reclamation within 3 years of completion of flow testing for each well.
- Interim reclamation, shaping, recontouring, and placement of growth medium would occur upon completion of flow testing for disturbed areas, except for access roads and reserve basins so that existing disturbances are reduced and blend into the natural landscape.

4.19.3 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, visual resources would not change from existing conditions

4.20 Wild Horse Management

4.20.1 Proposed Action

Approximately 82 acres of the North Stillwater HMA would be disturbed as a result of implementing the Proposed Action. Construction, human activity, and increased noise in the area from construction and drilling could temporarily displace wild horses from the area. However, most (approximately 91 percent) of the HMA is located outside of the Lease Area and areas of disturbance would not be located near any springs or watering holes, which attract wild horses. Wild horses would likely return to the area after construction.

4.20.2 No Action Alternative

Project features would not be constructed under the No Action Alternative; therefore, temporary displacement of wild horses from the area associated with construction activities would not occur.

4.21 Wildlife Resources

4.21.1 Proposed Action

Approximately 82 acres of salt desert scrub habitat would be disturbed as a result of implementation of the Proposed Action. Construction of access roads and installation of wells

would result in the direct loss of wildlife habitat for species associated with salt desert scrub habitats. Direct impacts from mortality to smaller, less mobile wildlife species could occur during construction if those species are present. Noise, human presence, and heavy equipment use during construction activities are likely to temporarily displace wildlife that may be present or near the project site and could have an indirect effect on wildlife species in the area. These indirect effects could reduce breeding success of species that are sensitive to human activity. These impacts are expected to be temporary and short-term for the duration of the proposed construction and drilling activities. Wildlife would be able to return to the disturbed areas upon completion of ground-disturbing activities. No population level impacts to wildlife species are expected as a result of implementation of the Proposed Action.

Wildlife species associated with the Stillwater Range, such as mule deer, would not be directly affected by construction or drilling activities. Mule deer utilize lower elevations when forage is covered in snow and during green-up in the spring. Mule deer may be affected indirectly by human activity and noise in that they may avoid the foothills near the Lease Area and seek areas of similar low elevation habitat away from disturbance. Overall, impacts to wildlife are expected to be minor.

4.21.2 No Action Alternative

Project features would not be constructed under the No Action Alternative. Therefore, construction of access roads and installation of wells would not take place, and the resulting loss of wildlife habitat would not occur.

5.0 CUMULATIVE IMPACTS ANALYSIS

Two alternatives were developed through Native American Consultation. There would be virtually no change in impacts disclosed under other resources by carrying the alternatives through all the sections for resources other than cultural, Native American and visual resources.

Under the No Action Alternative, project features would not be constructed under this alternative; therefore, the disturbance or effects associated with the Proposed Action would not occur.

5.1 Cumulative Impacts Assessment Area

Cumulative impacts are defined by the Council on Environmental Quality (CEQ) in 40 CFR 1508.7 as “impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.” Cumulative impacts from geothermal leasing in the Western U.S. were analyzed as part of the Programmatic EIS (BLM, 2008b).

The following discussion evaluates the potential impacts of the Proposed Action when taken in combination with the potential impacts of known past, present, and reasonably foreseeable future actions in the analysis area.

The cumulative impact assessment area (CIAA) is the internally drained Buena Vista Valley groundwater basin, which is shown as groundwater basin 129 in Figure 5.

5.2 Past and Present Actions

Land in the vicinity of the New York Canyon Lease Area is federally owned and managed by the BLM. Small private parcels exist throughout the western side of the Stillwater Range, with a more checkerboard pattern of BLM and private lands extending westward. The area is relatively undeveloped and the majority of the valley is used for cattle grazing. Small private parcels exist throughout the valley, and the Department of Defense conducts testing of low-level supersonic flight operations in the Stillwater Range and southward.

A review of BLM land management actions (LR2000) indicated numerous active ROWs, leases, and sales in the cumulative impact study area. These include mining, oil and gas exploration, placer and millsite claims, and ROWs for telecommunications, power transmission lines, pipelines, and irrigation.

Several ROWs or other authorizations have been granted on public lands within and adjacent to the Project Area. These include ROWs for transmission and telephone lines (fiber optic), roads, and geothermal leases. Following an existing graveled road just north of the Lease Area is the BLM ROW corridor for an existing AT&T fiber optic telephone line that also serves as a potential ROW for transmission line use. Active lode mining claims also are present in seven sections of T25N, R35E, in the southeastern portion of the site. A BLM ROW for power transmission exists north of the Lease Area. Firewood and Christmas tree harvests are regularly permitted by the BLM in the Stillwater Mountains.

The BLM Legacy Rehost (LR) 2000 Report System and the BLM National Integration Land System (NILS) GeoCommunicator list non-producing competitive and non-competitive

geothermal leases and geophysical exploration permits within the leased area of the NYC project. These leases are owned by TGP and its affiliates (BLM, 2009d). Additional geothermal leases surrounding the Project Area include the following:

- T. 25N., R. 35E., section 13 - Non-competitive geothermal lease NVN-079309 leased by Vulcan Power Co.
- T. 25N., R. 36E., sections 7, 18- Non-competitive geothermal lease NVN-079308 leased by Vulcan Power Co.
- T. 26N., R. 35E., section 25 and T. 26N., R. 36E., sections 29, 30 - Non-competitive geothermal lease NVN 076302 leased by ORNI 26 LLC

The Coeur Rochester gold and silver mine, located 15 miles north of the Lease Area, operated between 1986 and 2007. It is currently in the process of permitting to enable renewal of mining operations (as discussed in section 5.3 below).

5.3 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions are those actions that are known or could reasonably be anticipated to occur within the study area and within a time frame appropriate to the expected impacts from the Proposed Action. For this project, the time frame for potential future actions is assumed to be the lease duration, or approximately 35 years.

The BLM has received geothermal lease nominations for other land within the CIAA. Surface disturbance to construct additional roads and drill pads would occur. Drilling of exploration wells would be initiated. Because they are generally sequential, little overlap of the impacts is expected from the proposed exploration project and future geothermal exploration activities.

TGP has made it clear that if the geothermal resource exists, they will propose building a geothermal power plant in their lease area. The impacts and intensity of impacts associated with geothermal development in this area would vary depending on the type and location of activity proposed and would be evaluated at that time. The construction of a geothermal power plant in the project area would also produce a change to the visual landscape.

The existing Coeur Rochester mine, located 15 miles north of the Lease Area, is undergoing environmental review with the goal of renewing and expanding mine operations beginning in 2011 and extending for a period of up to 6 years (Mineweb, 2009). The Relief Canyon gold mine, located west of the Project Area, has announced its intention to resume mining in 2010 (Firstgold Corp, 2009). Construction and surface disturbance to expand the mining operations would occur.

BLM land records show no additional pending actions for the CIAA.

5.4 Cumulative Impacts to Affected Resources

5.4.1 Air Quality

Additional impacts to air quality could occur from expanding mining operations. All current and reasonably foreseeable future actions must comply with NDEP BAPC air quality regulations which specify environmental protection measures to ensure that standards are not exceeded. The contribution of the Proposed Action to cumulative GHG emissions would be negligible, and such

impacts would be minimized by implementing the BMPs as described in section 4.1.2. Air quality impacts from the Proposed Action would consist of temporary impacts during well construction, including fugitive dust from construction, diesel exhaust from internal combustion engines, and H₂S emissions during well testing. Fugitive dust would be mitigated by implementation of environmental protection measures specified by TGP and the best practical dust control measures specified in the NDEP BAPC Surface Area Disturbance Permit. As a result, the potential for cumulative impacts from the Proposed Action are minimal.

5.4.2 Cultural Resources

Proposed Action

Past and present actions on public and private lands have directly and indirectly affected the integrity of cultural resources determined eligible for the NRHP. Impacts to cultural resources in the CIAA have included recreation, wood and Christmas Tree cutting, fire, grazing, non-renewable minerals and fluid minerals exploration, and road building. Implementation of the Proposed Action could result in incremental impacts to cultural resources due to increased access to previously remote areas and impacts to the setting of NRHP eligible sites CrNV-02-9535 and CrNV-02-9577. However, if mitigation measures listed in Chapters 4 and 6 for cultural resources are implemented, incremental impacts are anticipated to be minimal.

Alternative 2

Under this alternative, drilling in the southern polygon would be prohibited and therefore impacts to sites CrNV-02-9535 and CrNV-02-9577 are not anticipated. Archeological sites in the vicinity would also be less likely to be subject to damage due to increased access. If mitigation measures in Chapters 4 and 6 are implemented, incremental impacts to cultural resources are anticipated to be negligible.

Alternative 3

Under this alternative drilling and other exploration activities in the southern polygon of the project area would be restricted to the area north of the road to the historic mining area. Impacts to the setting of sites CrNV-02-9535 and CrNV-02-9577 would be minimize by alluvial fingers between the existing road these two traditional access routes. Although, there would be more access to areas of sensitive cultural sites under this alternative than alternative 2, if mitigation measures listed in Chapters 4 and 6 for cultural resources are mitigated, incremental impacts are anticipated to be minimal.

5.4.3 Invasive, Non-native Species

As described in section 4.3, mitigation measures and BMPs would minimize the spread of invasive, non-native species under the Proposed Action. Because other current or reasonably foreseeable future actions also include construction or mining activities, the Proposed Action could potentially contribute to the cumulative risk of spreading invasive species in the area. Use of BMPs, including inventory and treatment of newly disturbed areas, would limit this impact.

5.4.4 Migratory Birds

Minor amounts of additional displacement could occur from mining activities. Mitigation measures requiring surveys for candidate and special status species, and inventories for migratory bird nests, if conducted during the appropriate season, and limiting ground disturbing

activities would help reduce the potential adverse effects if implemented for other actions. Implementation of the Proposed Action would minimize disturbance of migratory bird nesting habitat through avoidance, either by removing habitat for migratory birds prior to the nesting season or by conducting migratory bird nesting surveys and developing protection measures accordingly, as described in section 4.4.2. The Proposed Action has the potential to contribute to the cumulative effect on nesting habitat for migratory birds. This potential impact, however, would be minimized through use of mitigation measures and restoration of the Project Area.

5.4.5 Native American Religious Concerns

Proposed Action

Past and present actions on public and private lands have directly and indirectly affected the areas of Native American concern. Impacts to these areas of Native American concern have included recreation, wood and Christmas Tree cutting, fire, grazing, non-renewable minerals and fluid minerals exploration, and road building within the CIAA. The Proposed Action is seen as causing temporary, adverse impacts to the NRHP listed TCP. Implementation of the BLM proposed mitigation measures would reduce these impacts to being short-term and temporary. The proposed project would introduce visual (drill rigs, drill pads, wells, roads, vehicle traffic, man camp and other disturbances), audible (equipment and vehicle noise) and atmospheric (dust associated with vehicle traffic and operations) intrusions that are out of character with the TCP and that would adversely affect the integrity of setting and feeling of the Dave Canyon TCP. Since integrity, setting and feeling are part of the qualities that make this TCP eligible for listing on the NRHP, this constitutes an adverse effect and an adverse impact. These impacts would be temporary if the mitigation measures recommended by the BLM are implemented; therefore, the cumulative impacts of this action would be minimal.

Alternative 2

Past and present actions on public and private lands have directly and indirectly affected the areas of Native American concern. Recreation, wood and Christmas Tree cutting, fire, grazing, non-renewable minerals and fluid minerals exploration, and road building which have impacted the resources of Native American concern within the CIAA. Under Alternative 2, since drilling and other construction would not be allowed in the southern polygon, there would be no incremental cumulative effects to the Dave Canyon TCP and the TCP to the south of it. The implementation of the BLM mitigation measures would produce minimal cumulative impacts to the TCPs north of the Dave Canyon TCP.

Alternative 3

As noted above, a variety of activities in the CIAA have directly and indirectly affected the areas of Native American concern. Under Alternative 3, there would be some visual intrusions that are out of character with the TCP and would adversely affect the integrity of setting and feeling of the Dave Canyon TCP. The effects would not be as large as the Proposed Action. These impacts would be temporary if the mitigation measures recommended by the BLM are implemented; therefore, the cumulative impacts of this action would be minimal.

5.4.6 Threatened and Endangered Species

No threatened or endangered species are known to exist in the Lease Area; therefore the Proposed Action would not contribute to cumulative impacts to this resource.

5.4.7 Wastes, Hazardous or Solid

Solid waste and hazardous materials would be transported, stored, and used as part of the Proposed Action. All past, present and reasonably foreseeable future actions are required to transport, store, and use solid waste and hazardous materials in accordance with applicable state and federal regulations which are intended to protect the public and the environment.

Implementation of the BMPs described in section 4.7.2 would minimize the potential for wastes and hazardous materials to be released to the environment from the Proposed Action. When combined with other current and reasonably foreseeable future area activities, the increase in the total volume of wastes handled would result in a small increased risk of spill or other release of waste materials to the environment.

5.4.8 Water Quality (Surface and Ground) and Water Quantity

When combined with other current and potential future area activities, there would be an increased potential for impacts to surface water and groundwater quality. Potential impacts to groundwater temperature and quantity would be avoided or minimized through the use of BMPs for well construction. Drilling and well construction would be conducted in accordance with state and federal permit requirements. Percolation of geothermal fluids from well testing could have a temporary local impact on groundwater quality and water levels but would be minimized through the use of BMPs (i.e., bentonite clay lining of surface impoundments). Potential impacts to surface water would be temporary and local, and also would be avoided or minimized through the use of BMPs. Because potential impacts from the Proposed Action would be temporary and local, any contribution to cumulative impacts would be minimal. No other current or reasonably foreseeable future actions are expected to cause impacts to water quality in the vicinity of the Lease Area during the time frame proposed for well installation and testing.

Other Resources

5.4.9 Economic Values

The Proposed Action would have a minor beneficial impact on the local economy from hiring local populations, where possible, and local spending on supplies during the construction and drilling process. This impact would contribute to a positive cumulative impact on the local economy when combined with similar spending and hiring from other current and reasonably foreseeable future actions.

5.4.10 Fire Resources

The Proposed Action would pose a minor risk of sparking a fire from the use of heavy equipment. Because other current and reasonably foreseeable future actions carry a similar risk, the Proposed Action could contribute to the cumulative risk of fire started by human activity in the area.

5.4.11 Geology and Minerals

There are active mining claims located within the CIAA. The Coeur Rochester mine is undergoing environmental review with the goal of renewing and expanding mine operations in the area. Because there are mining claims within the Lease Area, it is possible that the Proposed Action could occur simultaneously with use of the area by mineral claimants. Such use could occur concurrently with the Proposed Action, and therefore the Proposed Action is not expected to negatively impact mining claims in the Lease Area.

5.4.12 Lands and Realty

The Proposed Action is consistent with BLM land use planning for the area and would not interfere with other ongoing or reasonably foreseeable future activities, and therefore would not contribute to cumulative impacts on land use.

5.4.13 Paleontological Resources

Direct and indirect impacts of the Proposed Action on paleontological resources would be limited, because the area has a low likelihood of containing paleontological resources. Because other intrusive actions are currently taking place in the cumulative impact study area (mining, oil, and gas exploration), the Proposed Action could contribute to cumulative impacts on paleontological resources. However, because of the low paleontological sensitivity of area resources, this incremental contribution would be minimal.

5.4.14 Range Resources

Potential impacts to grazing would occur from loss of forage, reduced forage palatability from dust during the construction process, and temporary displacement of livestock. When combined with other current and reasonably foreseeable future actions, the Proposed Action would contribute incrementally to potential cumulative impacts on range resources. The Proposed Action would not affect availability of water to livestock in the area, and the anticipated contribution of the Proposed Action to cumulative impacts would be minimal.

5.4.15 Recreation

The Proposed Action would not cause adverse impacts on recreational resources; therefore, cumulative impacts to recreational opportunities would not occur.

5.4.16 Soils

Soil erosion could be caused by implementation of the Proposed Action as well as by other current actions. Additional impacts to soils could be expected to occur from additional mineral exploration and geothermal exploration. The contribution of the Proposed Action to cumulative impacts on soil erosion would be minimized through the use of the measures described in section 4.16.2.

5.4.17 Special-Status Species

The Proposed Action would result in disturbance and loss of foraging habitat as well as temporary displacement of several sensitive species that may be in the Project Area including bats, golden eagles, ferruginous hawks, prairie falcons, loggerhead shrikes, burrowing owls and vesper sparrows. The disturbance from the Proposed Action would be an incremental contribution to cumulative effects on these species. Because sensitive avian species would likely return to the area after construction is complete, and because an abundance of similar habitat is available near the project site, the project's contribution to cumulative impacts on these species would be minimal.

The Proposed Action may affect Bighorn sheep use of the Stillwater Range lower elevations, and therefore may contribute slightly to the cumulative impacts on this species.

No cumulative impacts are anticipated for sage grouse. Cumulative impacts to pygmy rabbits, if present in the Lease Area, are expected to be slight.

5.4.18 Vegetation

The Proposed Action would include ground-disturbing activities that would result in removal of approximately 82 acres of salt desert scrub vegetation. Other current and reasonably foreseeable future activities could also result in the removal of small quantities of similar vegetation. However, this vegetation type is widespread in the CIAA, and the Proposed Action would not contribute to cumulative impacts to vegetation resources.

5.4.19 Visual Resources

Proposed action

Visual impacts from the Proposed Action would be limited and would occur primarily during the construction process. Other current and reasonably foreseeable future actions would have similarly limited impacts on visual resources, although some (such as mining operations) would be longer in duration. The contribution to cumulative impacts from the Proposed Action would be limited to the duration of drilling when drill rigs are present on site and before the wellpads are re-vegetated. The adoption of the BLM mitigation measures would reduce the cumulative visual impacts to a temporary, adverse impact.

Alternative 2

With no drilling in the southern polygon in Alternative 2, there would be no adverse visual effects to the Dave Canyon TCP. The adoption of the BLM mitigation measures would make the visual impacts to the other TCPs temporary.

Alternative 3

The cumulative effects of Alternative 3, with its limited drilling in the southern polygon, would be similar to those under the Proposed Action.

5.4.20 Wild Horse Management

The CIAA for Wild Horse Management is the North Stillwater HMA. Because human activity and noise resulting from the construction and drilling activities could temporarily displace wild horses from the area, the Proposed Action could contribute incrementally to cumulative impacts on wild horses. However, most of this impact would be temporary (occurring during the drilling process), and most of the North Stillwater HMA lies outside the Lease Area. Other ongoing and potential future actions, including mining, could have similar but longer-term impacts on the HMA. Therefore, the contribution of the Proposed Action to cumulative impacts on this area would be minimal.

5.4.21 Wildlife Resources

The primary direct impacts of the Proposed Action on wildlife resources would be temporary displacement of wildlife from noise, human presence, and heavy equipment use during well drilling and testing, and later during site reclamation. Habitat loss would be relatively small when compared to the surrounding similar habitat. The other impacts would be temporary; therefore, the expected cumulative impacts to wildlife resources would be minimal.

5.5 Irreversible and Irretrievable Commitment of Resources

No irreversible and irretrievable commitment of resources is expected as a result of the Proposed Action.

6.0 MITIGATION AND MONITORING

BLM requires that decisions be implemented in accordance with the appropriate decision document. Monitoring is needed to ensure that actions taken comply with the terms, conditions, and mitigation measures identified in the decision. BLM would fulfill this responsibility by monitoring the implementation of mitigation measures adopted as conditions of approval to the submitted Operations Plan and Right-of-Way application, as well as the stipulations attached to each of the geothermal leases.

In addition to implementing the special lease stipulations attached to the federal geothermal leases (See Appendix A) and the ROW “General Terms and Conditions” to be included for off-lease access and surface pipelines (See Appendix B), TGP has proposed to carry out environmental protection measures and BMPs as set forth in the Gold Book (BLM, 2007) that would be implemented as described in the Proposed Action and as described in chapter 4 of this document.

Air Quality

- Surface access roads with aggregate materials, wherever appropriate.
- Post and enforce speed limits to reduce fugitive dust (speed limit of 15 miles per hour, as necessary).
- Apply dust abatement techniques to earthmoving, excavating, trenching, and grading activities (such as watering, requiring loader buckets to be emptied slowly, minimizing drop heights, etc.).
- Minimize equipment and vehicle idling times during construction activities.

Fire Resources

- All construction and operating equipment would be equipped with applicable exhaust spark arresters.
- Personnel would be trained in fire prevention and initial response, and fire extinguishers would be available at each drill site.
- Water that is used for construction and dust control would be available for fire suppression.
- Personnel would be allowed to smoke only in designated areas and would be required to follow applicable BLM regulations regarding smoking.

Invasive Non-Native Species

- Avoid or treat existing weed infestations prior to disturbance.
- Map and treat areas that become infested during construction.
- Use certified weed-free seed and mulching materials.

Lands and Realty

- Applicant shall contact right-of-way holder for location on underground utilities.

Migratory Birds

- To minimize impacts to migratory birds and other wildlife, wells and roads would be recontoured and reseeded following completion of the Proposed Action as described in Section 2.1.8. Erosion-control measures would be implemented as described in section 4.16.2. Topsoil would be salvaged and reused whenever possible and in a timely manner as described in section 2.1.9.

Paleontological Resources

- Subsurface disturbance would not occur in stock pile areas or as a result of overland travel routes.

Range Resources

- TGP has committed to fence pits in conformance with the Gold Book pages 17-18 (BLM 2007).

Soils

- BMPs, including development of a SPCC plan, would be implemented to prevent the release of hazardous materials to the environment which could affect soil resources.
- Proposed facilities would not be constructed in areas with steeper slopes.
- Excavation into native soil during construction of well pad reserve pits and central sump would be minimized to the maximum extent possible.
- Topsoil would be salvaged and reused whenever possible and in a timely manner.
- Temporarily disturbed areas would be reseeded where previously vegetated using a BLM approved seed mixture.
- Erosion control measures, including but not limited to silt fencing, diversion ditches, water bars, temporary mulching and seeding, and application of gravel or rip rap, would be installed, where necessary, immediately after completion of construction activities to avoid erosion and runoff.
- Access roads would follow existing contours to the maximum extent possible. In areas where new access roads must be constructed across slopes, erosion control measures would be installed as necessary, in accordance with Gold Book standards (BLM, 2007).
- An average of 6 inches of gravel would be used as road surface because roads would be used during all seasons. Up to 3 feet of gravel may be used on some sections of road and no gravel would be used on road sections where the natural surface is adequate.
- Additional gravel would be laid down when ground conditions are wet enough to cause rutting or other noticeable surface deformation and severe compaction. As a general rule, if vehicles or other project equipment create ruts in excess of 4 inches deep when traveling cross-country over wet soils, the soil shall be deemed too wet for vehicle use, without the application of a gravel surface.

- If construction occurs in areas of very soft soils, up to 3 feet of aggregate would be used.
- An NDEP BAPC Surface Area Disturbance (SAD) permit documenting the best practical management practices to be used, would be required for the project because the surface disturbed by the project would be greater than 5 acres.

Surface Water and Groundwater Monitoring Plan

- Development of a construction Stormwater Pollution Prevention Plan (SWPPP) and spill prevention, control, and countermeasures (SPCC) plan.
- Erosion-control measures would be implemented.
- From springs to be identified in consultation with the BLM: Representative temperature and flow rate – once immediately prior to the commencement of drilling and once immediately following the completion of drilling; and once per year until all wells have been abandoned.
- During drilling or flow testing of selected observation wells, to be identified in consultation with the BLM: Representative temperature once each week until drilling, flow testing or water extracting is completed.
- When permanent new access roads must cross ephemeral washes, rolling dips would be installed. The rolling dips would be designed to accommodate flows from at least a 25-year storm event. Culverts may be used wherever rolling dips are not feasible.
- Excavation into native soil during construction of the well pad reserve pit and central sump would be minimized to the maximum extent possible.
- Settled bentonite clay from drilling mud would accumulate on the bottom of the drill pad reserve pits and central sump to act as an unconsolidated clay liner, reducing the potential for drilling fluid to percolate to groundwater.
- A BLM-approved grouting and casing program for construction of observation wells would be implemented to prevent water quality effects on groundwater during or after well installation.
- Borehole geophysics analyses (cement bond logs) would be conducted to document that well casing grouting activities provide an effective seal isolating the geothermal aquifer from shallow alluvial aquifers, therefore minimizing potential impacts on surface springs or streams.
- The project would use BMPs to ensure that any geothermal fluid encountered during the drilling does not flow uncontrolled to the surface. These include the use of “blow-out” prevention equipment during drilling and the installation of well casing cemented into the ground.
- TGP would obtain necessary working in waters and/or groundwater discharge permits and provide a Notice of Intent to NDEP prior to well pad construction.
- TGP would submit a GDP application, including detailed drilling and casing procedures, to BLM for approval prior to initiating geothermal drilling.

Vegetation

- The BLM-approved seed mixtures as shown in Table 12 would be used.

TABLE 12
Proposed Seed Mix

Species	PLS lbs./acre	Bulk lbs./acre	PLS/sq. ft.
Fourwing saltbush	3.00	5.00	4
Shadscale	3.00	5.00	4
Indian ricegrass	1.00	1.25	4
Forage kochia	0.50	0.75	5
Totals	7.50	12.00	17

Note: PLS = Pure Live Seeds

- TGP would consult with BLM regarding the timing of reseeding, specific seed mixtures, and application rates to be used to improve the success of reseeding.
- Disturbed areas would be re-contoured to blend with the surrounding topography. Topsoil would be salvaged whenever possible and reused in a timely manner.
- Impacts to vegetation would be minimized by reseeding all areas of access roads and well pads not required for subsequent energy production using weed-free and BLM-approved seed mixtures.

Visual Resources

- Well heads would be painted a color that blends with the surrounding area, as approved by the BLM.
- All drill rig and well test facility lights would be limited to those required to safely conduct the operations, and would be shielded and/or directed in a manner that focuses direct light to the immediate work area.

Wastes, Hazardous or Solid

- Small quantities of solid wastes (paper, plastic, and other garbage) generated by the Proposed Action would be transported offsite to an appropriate landfill facility.
- Portable chemical toilet wastes would be removed by a local contractor.
- The hazardous material spill and disposal contingency plan would be submitted to and approved by the BLM and made readily available on site before operations begin.
- Secondary containment structures would be provided for all chemical and petroleum/oil storage areas during drilling operations. Additionally, absorbent pads or sheets would be placed under likely spill sources and spill kits would be maintained on site during construction and drilling activities to provide prompt response to accidental leaks or spills of chemicals and petroleum products.

- Handling, storage, and disposal of hazardous materials, hazardous wastes, and solid wastes would be conducted in conformance with federal and state regulations to prevent soil, groundwater, or surface water contamination and associated adverse effects on the environment or worker health and safety.

Water Quality (Surface and Ground) and Water Quantity

- In order to prevent a release of geothermal fluids to surface water features, drilling muds and geothermal fluids would be contained in the well pad reserve pit; or piped or trucked to the large central sump when quantities dictate.
- To avoid communication between the geothermal aquifer and the shallow groundwater aquifer, BMPs for well installation and testing would be implemented as described in section 4.8.2.
- A monitoring plan would be put in place to assess whether impacts to quality, quantity, or temperature of surface water occurred as a result of observation well installation and testing.
- Project-related water would be obtained from a non-potable water well to be installed with an estimated depth of up to 500 feet and permitted under an Oil and Gas Waiver by the Nevada Division of Water Resources.

6.1 BLM Recommended Mitigation Measures

In addition to the lease stipulations and TGP's proposed mitigation, the following mitigation and monitoring measures were developed through the analysis as documented in this Environmental Assessment and made part of the decision record and GDP approvals as Conditions of Approval and terms and conditions to the ROW grant.

Cultural & Native American Religious Concerns

- TGP would provide training to all onsite employees on the importance of protecting cultural resources and the consequences of any violations.
- Crews would be required to stay within the project site as needed to perform their duties. This would not preclude crew members from travelling to and from the project site.
- Signage would be posted throughout the Project Area to indicate that access roads are "no through traffic".
- No overland travel would be allowed outside the approved disturbance areas which are limited to roads and pads.
- The specific locations for well pads and access roads would be identified in individual Geothermal Drilling Permits (GDPs), which would be submitted for review by the BLM to ensure compliance with BLM stipulations prior to construction. No new NEPA documents would be required for actions proposed inside the Project Area.
- Construction and drilling would be prohibited in the southern leases (N-86890, N-76300, N-76299) during the pine nut harvesting season, September and October. If the pine nut season extends into November, drilling and construction would be prohibited. Each year, through

consultation with the tribes and users of the TCP, the BLM would determine if pine nut season extends into November.

- All non-emergency drilling and construction activities would be prohibited during the pine nut season (September, October and possibly November) in the southernmost leases (N-86890, N-76300, N-76299). Emergency work would require approval of the Authorized Officer.
- Construction of well pads would remain at least 50 meters away from CrNV-02-9535 and CrNV-02-9577. Any new constriction crossing CrNV-02-9577 would be done only with permission by the BLM and at locations designated by the BLM.
- TGP would not restrict access for the Native Americans to CrNV-02-9535 and CrNV-02-9577, nor put any impediments along these two routes that would prohibit travel by the Native Americans. Native Americans would be allowed access to TCPs and sacred sites.
- If the traffic counter installed along CrNV-02-9577 to monitor people driving into the TCP yields rising numbers, the BLM would evaluate the need for a gate to be installed at the road leading into the project area.
- For the restoration of the ecological health of the TCPs, TGP would fund tamarisk/salt-cedar removal from the Dave Canyon TCP. This project would be completed by the third year of the drilling project. Details would be resolved between TGP, the BLM and the users of Dave Canyon TCP. Depending on the methodology used to remove the tamarisk/salt-cedar, temporary jobs may be available to Native Americans assisting the BLM in plant removal.
- Project traffic would be restricted from utilization of traditional routes CrNV-02-9535 and CrNV-02-9577.

Fire Resources

- All flammable materials would be stored in accordance with the appropriate Federal, State and local statutes.

Interim and Final Reclamation

- Disturbed areas in the southern polygon of the Project Area (associated with leases N-86890, N-76300 and N-76299) would undergo interim reclamation within 6 months of completion of flow testing of each well. Disturbed areas in the central polygon of the Project Area (associated with leases N-76299, N-76298 and N-76301) and in the northern polygon of the Project area (associated with leases N-76301 and N-86893) that are not needed for active support of operations would undergo interim reclamation within 3 years of completion of flow testing for each well.
- Interim reclamation, shaping, recontouring, and placement of growth medium would occur upon completion of drilling and well flow testing for disturbed areas, except for the access roads and reserve basins so that existing disturbances are reduced and blend into the natural landscape.
- Seeding would be completed along with interim or final reclamation or during the next growing season (October through December).

- Surface facilities remaining on site for observation wells would have matte finishes.
- The BLM Winnemucca District Office, Humboldt River Field Office would be notified in writing when reclamation operations commence and are completed.
- If any well that is **not needed for active support of operations** sits idle for longer than one year, the well would be plugged and abandoned to comply with all Federal and State of Nevada regulations, and final reclamation of disturbed areas would be completed within 6 months from the date of proper plugging and abandonment of the observation well.
- All exploratory drilling would be completed within 3 years of the Decision Record date. A reclamation plan would be submitted to the BLM for approval prior to commencement of final reclamation. Wells would be plugged and abandoned, and well pads recontoured and successfully re-seeded with a weed-free BLM approved seed mix.
- Gravel depth measuring in excess of 8 to 10 inches would be reduced or removed from constructed well pads. The remaining gravel would be topsoiled, ripped and seeded and/or the gravel would be buried deep in the recontoured cut to prevent excess surface exposure. Reserve pits and central sump would be backfilled after they are dry and free of waste and graded to conform to the surrounding terrain.

Lands and Realty

- General Terms and Conditions would be made part of the ROW grant (see Appendix B).

Surface Water and Groundwater Monitoring Plan

- Water would be monitored from the seasonal creeks emanating from Hughes Canyon, Dave Canyon, New York Canyon, Logan Canyon, and Big Ben Canyon.
- TGP would not utilize any water from the stock pond, nor the seasonal creeks in any of their operations. TGP would avoid doing any modifications to the stock pond that would destroy its integrity.
- TGP would obtain necessary working in waters and/or groundwater discharge permits and provide a Notice of Intent to NDEP and a sundry notice to BLM prior to well pad construction.

6.2 List of Preparers

Name	Title	Project Expertise
BLM		
Marcie Purkey	HRFO Geothermal Project Manager	Geology/Fluid Minerals
Sheila Mallory		
Fred Holzel	HRFO Fluid Minerals Program Lead	Geology/Minerals
Bob Edwards		
Raquel Minky	HRFO Fluid Minerals Program Staff	Geology/Fluid Minerals
Lynn Ricci	Planning and Environmental	NEPA compliance; planning
Lynn Harrison	Coordinator	
Mike Zielinski	Soil scientist, Air Quality & Riparian Zone Specialist	Riparian zones; soils; vegetation
Jean Black	Hydrology specialist	Hydrology
Derek Messmer	Supervisory rangeland specialist	Invasive, non-native species
Robert Burton	Natural resource specialist	
Celeste Mimnaugh	Threatened and endangered species and wildlife biologist	Wildlife
Peggy McGuckian	Cultural specialist, Native American Coordinator and paleontology specialist	Cultural resources; paleontology
Mark Hall, Ph.D.	Cultural Specialist and Native American Coordinator	Cultural resources; Native American Concerns
Joey Carmosino	Outdoor Recreation Planner	Recreation; visual resource management
Ron Pearson	Rangeland management specialist	Rangeland management
Sarah McGuire	Minerals data management and GIS Specialist	LR2000; GIS
Debbie Dunham	Lands and realty Specialist	Lands; realty
Jeff Johnson	Supervisory Fire Management Specialist	Fuels, fire management and fire rehab specialist
David Vincelette	Environmental Protection Specialist	Hazardous materials, environmental permitting and regulatory compliance
CH2M HILL		
Linnea Eng, P.E.	EA Task Manager	Project description; cumulative impacts analysis
W. Geoffrey Spaulding, Ph.D.	Paleontologist	Paleontological resources
Amy Hammontree	Biologist/Environmental Scientist	Recreation; range resources; lands and realty; economic values
Katy Oakes	Biologist	Biological resources
Aaron Fergusson	Cultural Resources Specialist	Cultural resources
Cindy Newman	Ecologist/Environmental Scientist	Soils; water resources; biological resource
Kenneth Shump, P.G.	Senior Hydrogeologist	Geology; water resources

Jennifer Claghorn, P.E.	Environmental Engineer	Air quality
Staci Hill, P.E.	Environmental Engineer	Visual resources; wastes, fire resources
Mark Greenig	Environmental Planner	Visual resources
Christine Roberts	Senior Environmental Planner	NEPA specialist; senior review
Amy Lahav	EA Preparation Manager	Permitting specialist
Jerry Salamy	Senior Project Manager	Permitting specialist
Intertech Services Corporation		
Mike Baughman, Ph.D.	Consultant	NEPA compliance, senior review

6.3 Agencies, Groups, and Individuals Contacted

Name	Agency	Project Expertise
Tom McKay	Natural Resource Conservation Service	Soils
Jeryl Gardner	Bureau of Water Pollution Control, NDEP	Water resources
Kristine Hansen	USACE, Reno District Office	Wetlands and waters of the U.S.
Melissa Marr	Nevada Division of Water Resources (DWR)	Water resources
Victor Mann	Lovelock Paiute Colony, Chairman	Native American religious concerns
Rochanne Downs	Fallon Paiute Shoshone Tribe, Vice-Chairperson	Native American religious concerns
Donna Cossette	Fallon Paiute Shoshone Tribe, interested party	Native American religious concerns
Rebecca Palmer	State Historic Preservation Office	Cultural resources

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